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Standardization and Factory Production in the Building of Low Cost Homes

Results of an experiment in the production of large standardized units entering into house construction

The diffuse nature of the housing industry, the numerous manufacturers, distributors, and trades entering into the building of a single house, makes the problem of applying modern techniques of standardization and mass production to housing extraordinarily difficult. Although producers of a few of the elements entering into dwelling construction have established standards for their products, the individual buyer of a house has in general gained little, partly because of his ignorance of the requirements of sound construction.

With a large percentage of home buyers getting shoddy houses and paying excessive prices for them, the obvious need for rationalization in the housing industry with the utilization of standardization and mass production to improve quality and lower costs is resulting in increasingly frequent demands for a change, either on the initiative of the industries concerned or of outside agencies.

The most recent statement on this subject is made by Grosvenor Atterbury, New York architect, who, in a report published by the Regional Plan of New York, describes actual experiments carried on at Forest Hills, Long Island, in the building of houses with standardized factory-made units.

The following is an abstract of Mr. Atterbury's report:

The man in the street—none better—knows what has happened to his rent bill in the past fifteen years. The cost of housing has more than doubled, following a corresponding increase in the wage and material cost of the building industry.

On the other hand, statistics quoted from the Department of Labor show that in many of the other basic industries, in spite of similar increases in wages, the manufacturing cost of the product has actually declined. In other words, the efficiency of labor has increased more than the wages.

So we arrive at the deadly parallel: The productivity per man, taking the automobile industry as an example—and there are others even more striking—has increased 172 per cent, while the productivity per man in the housing industry has actually decreased, in some trades nearly 50 per cent.

In the explanation of this lies the key to the solution of the housing problem. It is, of course, machinery, mass and factory production.

Strangely enough, it is difficult to name a practical art which throughout all the centuries of man's civilization has made slower progress than the art of home building. Notice that the writer does not say "building construction," although if we were to except the past 25 or 30 years, these strictures would apply to the entire field of building construction. Until the discovery and development of steel truss construction and the rediscovery of the use of concrete, we have been practically following, generation after generation, century after century, methods substantially perfected by the mound-builders.

Huge Expenditures for New Housing

Over nine hundred million dollars is the rough estimate of our annual budget for recorded home building. Why then, do we fail to solve the problem of small houses on a commercial basis, when our great office buildings, factories, hotels, and apartments keep pace with the public needs and pay good profits into the bargain? The explanation lies largely, of course, in the fact that the individual house is a product of disorganized, individual effort, whereas the great building is sufficiently important to justify careful organization and concentration of all the coordinate activities necessary for its production.

It is organized construction against disorganized construction; cooperation against disjointed individual effort; to a growing extent, standardization against constructional chaos.

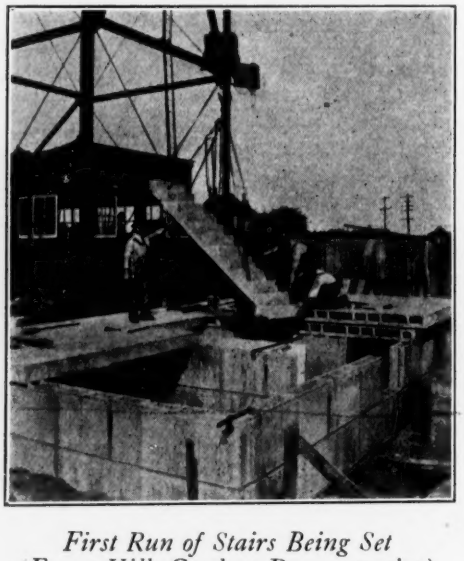
It comes, then, to the question of whether there is any vital reason why the great housing problem should not avail itself of just such modern methods of combination, cooperation, concentration, standardization, and methods of production as have produced such astonishing results in almost every other commercial activity in this country. It may be said that the building of the individual small home involves such a small sum as to make it impractical to do so. But it should be borne in mind

that it was the cheapest type of watch that made the dollar famous, and that you can buy about a dozen Fords for the cost of a single working man's house.

Yet the fact is that scientific and cooperative principles have been practically applied to the production of almost every other item in the worker's living account but the second largest single one, that of his housing. His food and his clothing are factory products, largely guaranteed, sometimes by the Government. His house is usually custom-made, and bought at the mercy of a speculative builder.

A proposal to clothe the destitute with custom made garments would be laughed to scorn. Of stock patterns and size, clothing can be turned out in quantities at a fraction of the cost of individual manufacture. Yet we are enthusiastically trying to house the majority of the population in custom-made tenements and are puzzled and worried when we find that, in spite of most model planning, the cost of the model dwelling fails to go down so as to bring its rentals within the means of the laboring classes whom we wish to reach. In fact, in this respect, we find it difficult to compete successfully against the old style of dwelling.

The obvious economic solution of this problem lies in the standardization, not necessarily of the general plan, but of its various component



First Run of Stairs Being Set
(Forest Hills Gardens Demonstration)

units and structural elements. Carried to its logical conclusion, this principle would result in a system of standard dwelling manufacture—in a ready-made system, if you please—of wholesale fabrication like that which has already given the worker his cheap shoes and his ready-made suit of clothes.

It will doubtless be asked how scientific research can be applied to such a subject as housing, for most of us regard houses and tenements as such commonplace and obvious things that we find it difficult to class their production as, in any wise, a scientific proposition. And, in fact, as the art is ordinarily practiced today, it certainly has little resemblance to a science.

While it is true that such methods have never been applied to the housing problem as a whole, we may cite as an illustration of their practical application in one field, the Studies in Economic Construction.[1]

Program for Demonstration

This work was confined to the element of construction alone as being the largest single item of cost, and the one that presented the most obvious evidence of waste of time, labor, and materials, and, consequently, the greatest opportunity for savings by their elimination.

The program was based on a logical analysis of the problem of house production, without regard to existing methods, customs, or standards, bearing in mind only the up-to-date resources of material and power and inventive skill that have made possible the revolutionary improvements and economics in almost every other great industry today.

Without going into detail, the resultant program was developed with the object of securing the following general results:

1. The transfer, as far as possible, of the processes of building construction from the field into the factory, together with
2. The application of standardization of structural elements, not the whole, together with their increase in size, to the maximum degree compatible with flexibility of design and successful handling by modern engineering methods; and as a result
3. The organization of wholesale production of housing on the principles of shop manufacture, making possible an elimination of waste and processes and labor similar to the savings made in other highly developed manufacturing industries. These results are achieved, of course, principally by standardization, quantity production, and machine manufacture.
4. But almost equally important from both economic and social points of view, the subsequent removal of the building business from the class of seasonal occupations into that of continuous all the year around employment and production. This alone would mean a saving in lost time of 20 to 30 per cent.

The secondary objects, more or less corollary

[1] An experiment in the production of houses from standardized factory built units, carried on at Forest Hills Gardens, Long Island, N. Y.

to the above, included that of securing for the design and construction of the laboring man's dwelling the benefit of highly skilled talent, both

Setting Floor Slab in 20 Minutes
(Forest Hills Gardens Demonstration)

aesthetic and practical, such as can never be obtained in the retail or individual production of the cheap house or tenement as it has heretofore been produced.

Furthermore, the quantity production of cheap dwellings on lines determined by really highly skilled designers and experts in all departments would do much toward advancing the cultural education of wage earners, as well as their health, social standards, and contentment.

In view of the actual results of the studies and demonstrations, there is no longer any doubt but that, if applied comprehensively on a large scale to the working man's dwelling, the principle of factory production would mean an initial reduction of 20 or 30 per cent in the cost of the shell, in addition to the substitution of an absolutely fire-proof for the ordinary brick and wood structure. And in the course of a few years of continued and concentrated study, experiment, and demonstration, it might reasonably be expected to produce such further savings that the cost of the minimum type of housing could be reduced to one-half of the present figures or less than that of ordinary wooden frame structures.

That the lamentable conditions of the past 25 years have been permitted to continue so generally is a matter of reproach to our highly organized state of society, the more so because the cure will begin just as soon as this country makes up its mind to mobilize sufficient of its brains, energy, and money to do away with such conditions.

The photographs are selected from the records of the various field demonstrations to illustrate in general the character and progress of the work after 1907 when the first few years of survey and elimination were completed.

The general principles then determined as the basis of the program were:

The maximum possible adaptation of design to the most economic methods of building construction.

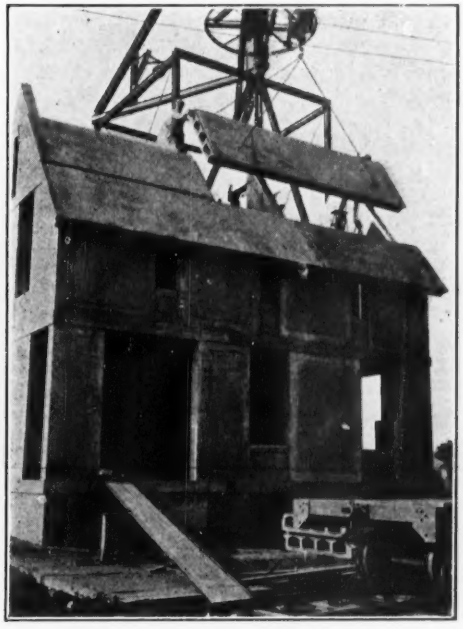
The adaptation of materials and methods of construction to the latest and most efficient mechanical devices, meaning the minimizing of hand labor; and consequently

The readjustment of the building unit with the object of reducing the number to the minimum and increasing their size to the maximum compatible with economic duplication and handling.

The adoption of a system of shop manufacture with its possibilities of standard economic conditions of all kinds.

The maximum consolidation of processes in manufacture, meaning the further elimination of waste—time, labor, and material.

The maximum of standardization in design



Twelve Slabs to Complete Entire Roof
(Forest Hills Gardens Demonstration)

compatible with certain practical and aesthetic standards—meaning still further economy in cost of plant and mechanism required for the manufacture and erection of the units.

It is to be noted:

That the practical expression of the foregoing theoretical solution, ultimately developed into something astonishingly like houses built with children's blocks enormously magnified.

That this principle is not dependent on the use of any particular material or process—although the greatest economy in manufacture thus far was found to be a casting process; and this involved the use of some cementitious material—such as gypsum or cement—as a base.

That while these demonstrations suffered from the fact that circumstances, especially during the war period, did not ever permit the use of more than six or seven standard molds, it was proved that with a series of eighteen or twenty practically any plan could be executed to within a few inches.

Consequently, that substantially all of the economic advantages derived from the use of standardization and large ready-made units could be realized with surprisingly little detriment to the aesthetic and architectural results.

That all of the groups illustrated were constructible out of the same standard blocks or sections—though for experimental purposes certain variations were purposely made in each operation both in type and size.

That these structures, entirely composed of but one material, are not subjected to invisible wear and tear like ordinary buildings built with a dozen materials, each acting differently under varying conditions of heat and humidity.

Mr. Atterbury cites cost figures to show a saving of over 45 per cent in the construction and placing of a standard wall section as compared with other types of fire-proof construction. He concludes by urging the organization of a powerful Research Institute of Economic Housing to carry on research, demonstration, and education leading to a scientific solution of the problem.

In a supplementary statement made by Mr. Atterbury concerning the report, he said:

"Factory production of houses would mean more employment in the housing industry rather than less. Organized labor looks askance at any increase in the employment of labor saving devices, especially in these days of unemployment, on the ground that it will tend to throw more men out of work.

"The answer to this is that there is an enormous market awaiting the really cheap workingman's home—one he can really afford to buy and that is really worth what he pays for it.

"The supplying of this market means the birth of a new industry—the manufacture of economic homes—in which the present intermittent employment of labor in the field will be replaced by continuous all the year round work with an enormously increased field for labor and an efficiency justifying high wages.

"Under the existing antiquated building methods mechanics at $12 and $15 a day can never produce a small house that is worth the money it costs. It is a 'poor buy' even if the laboring man has the money to pay for it. Even at cost it is poor value compared with food and clothing—and many of his luxuries! The rich man, perhaps, could afford to pay for the waste included in the price. The poor man most certainly cannot, and it is doing him a questionable service to help finance such a purchase.

"On the other hand, cut the cost by scientific factory production and offer him a really good bargain, well designed, fireproof, and substantial, involving but a small fraction of the ordinary upkeep of the present so-called low cost houses, and you will open up a market even greater than did the original Ford motor. As in that industry, in spite of labor saving devices and methods—really because of them—there will come an enormous increase in the labor employed as well as the opportunity for the laboring man himself to make a really wise investment within his means, in which case the various plans to facilitate his ownership of his own home will be good business for everybody."

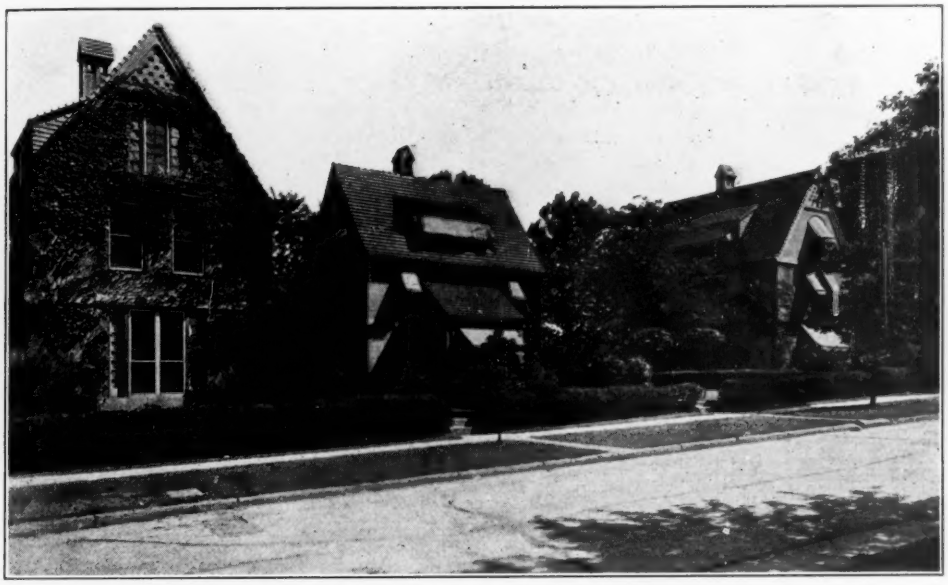
Testimony indicating the need for research and standardization in housing of the type described by Mr. Atterbury is abundant. In a publication issued by the National Builders' Supply Association several years ago it is stated:

"A national building council recently disclosed the fact that the average house built today has a useful life of but 12 years—that after 12 short years it will no longer be habitable—or can be made so only by unreasonably expensive repairs."

There has been considerable objection to standardization in housing, resulting from belief that such standardization would lead to the construction of long rows of houses of precisely the same pattern. An example of such objection is furnished by the *Albany News* which said editorially in the July, 1929, issue in commenting on an address by Edward A. Filene on housing standardization:

"Will the time come when a man shall be known by the name of the manufacturer of his house as he is known today by the brand of automobile he buys? Hardly that. At least it is to be hoped that this never can come to pass.

"America does not want rows and rows of houses that are all alike. It does not want



A Group of Standardized Factory-Made Houses Erected in 1920 at Forest Hills Gardens

these even in some sections of its cities. The monotonous sameness would be depressing and, more than that, it would be utterly displeasing.

"America can become too much standardized. It is now standardized enough. It should have individuality in some respects and particularly in its homes. True, large concerns might employ the best of architects and they might with variations produce attractive homes. Perhaps that is Mr. Filene's idea. But we do not want any rubber stamp home building in America."

The better understanding of the true nature of standardization on the part of both the press and the public, as applied to housing, is evidenced by the unanimously favorable editorial comment which followed the announcement of Mr. Atterbury's proposals. The *New York World*, for example, said:

"Here (housing) is one primal need of mankind, as universal, almost, as the need of food, as to which demand has not been followed by supply in anything like adequate measure. At present costs of production in and near our large cities, houses cannot be built and sold or rented at prices which low-income families can afford to pay. The reason is partly the shockingly wasteful methods in common use for financing speculative building by bonus-bought second and third mortgages; it is mainly that there has been no modern improvement in methods of construction at all comparable with inventive progress in other lines of activity. . . .

"The older methods and materials would often continue in use for aesthetic and practical reasons, but there is no reason why an ample supply of cheaper housing, say, of the poured-concrete type, should not be made available for those who need it.

"The further development and production of cheaper housing would be doubly welcome at this time of too general unemployment. It would give the business world the badly needed fillip of a new industry."

The *New York Evening Post* declared that the establishment of a Housing Institute such as Mr. Atterbury proposed would be a most important public service.

The attitude of the industries which would be affected by the rationalization of housing construction is the subject of an editorial which appeared in *Brick and Clay Record* of Chicago in May, 1930. Since it presents a valuable discussion of the subject, this editorial is abstracted at some length:

It is safe to say that a great many prospective

home builders would much prefer to buy their homes as they would their automobiles, to be delivered to a certain building site, rather than to pore over plans, engage architects, and contractors and worry over the purchase of materials, the quality of which they are seldom competent to judge.

It is argued that the theory of selling complete homes will never be successful because of the desire of people to possess a home that is distinctive and different because it would, of necessity, standardize home construction to a large extent. Offsetting these opinions, however, are the experiences of organizations like the Architects Small House Service Bureau and various building material associations that furnish plans to prospective builders. Almost invariably the people who have purchased the plans offered have practically standardized on a very few designs. Another argument for the complete home "factory" is the paramount consideration of cost. If standardized homes can be bought at a substantial saving over specially designed and built houses, they will most certainly be sold in large quantities because most people are willing to deny their desire for something distinctive and original if that desire becomes expensive.

Further emphasis to the belief that we are headed into an era of factory fabricated homes lies in the development of the steel frame house. Steel manufacturers and others are working to produce a simple type of steel framing that will add little or nothing to the cost of building a home.

Now, this is all very interesting, but where does the brick and tile manufacturer fit into the picture? What's the difference who builds the houses or how they are built, won't brick and tile always be furnished as essential materials?

In considering the answers to these questions the manufacturer should bear in mind that there are in reality two trends which home building may follow. One of these employs the method now used by the mail order houses in which all the materials and labor for certain standardized plans are furnished with a minimum of effort and time on the part of the home builder. The other trend is toward the development of factory fabricated homes which in all probability will mean changes in the design of homes and probably in the materials that are now in common use. In other words, the factory fabricated home will discard tradition and custom in an effort to design the best home at the lowest cost.

Of the two the latter is probably the most important trend insofar as it affects the clay products industry. The chief difference to the brick and tile manufacturer in the case of the house as sold by mail order companies is that he will have to sell his products to a different purchaser. His customers will be fewer, purchases will be made in larger volume though they will be made more on a cost than on a quality basis, and prices wil have to be shaved to the last cent.

In the case of the factory fabricated home it will be necessary for the products of the clay products industry economically to fit into whatever construction scheme is finally evolved. . . . When it (the fabricated house) becomes a reality this industry should be ready with a product that will fit into the new scheme and give the public the same advantages in beauty, economy, and permanence which brick and tile have always conveyed in much greater measure than any competing product.

There is, of course, the possibility of designing a factory fabricated home which can economically use the existing shapes and designs of clay products. In either case, however, the movement merits a close study on the part of clay products manufacturers.

Germans Reduce Varieties of Motors, Lubricants, Air Hose

Interesting statements concerning the results of standardization in the metal industry were made at a meeting for the promotion of introduction of standards into practice held last year in Saarbrucken, Germany, under the auspices of the German national standardizing body. The data, supplied by a committee on economy of operation of the Society of German Iron and Steel Manufacturers, were based on results obtained in iron and steel plants. The number of different types of three-phase motors, amounting to 1738 before standardization, was reduced to 56 types. It was estimated that the stock of replacement parts was consequently reduced to one-fifth of its former size. Furthermore, 100 kinds of oil were originally used. These were reduced to 15 standard kinds. Before standardization there were 61 sizes of compressed air hose; this number was reduced to nine. In some cases standardization and reorganization of stocks resulted in a reduction of the stock of materials by 50 per cent, with corresponding saving in interest on invested capital.

Standard for Woodruff Keys Is Available

The standard for Woodruff Keys, Keyslots, and Cutters (B17f-1930) approved as American Standard in December, 1930, has been published and is available for loan, or purchase at 35 cents per copy, through the ASA Information Service.

F. J. Schlink, Assistant Secretary, Resigns to Direct Consumers' Organization

On March 1, 1931, the Association lost the services of F. J. Schlink as Assistant Secretary. Mr. Schlink came to ASA as Assistant Secretary in 1922 from the Western Electric Company. He had previously been associated with the U. S. Bureau of Standards as physicist and technical assistant to the Director, with the Firestone Tire and Rubber Company, and with other organizations.

F. J. Schlink

Throughout his connection with the Association, Mr. Schlink has carried the major responsibility for work on specifications. At first he also handled all of the mechanical projects, and up to the time of the enlargement of the ASA staff, early in 1930, he continued in charge of a large number of these mechanical projects.

Typical of his undertakings were the translation and digestion of a great mass of material coming from European countries on the subject of geometric series used as "preferred numbers" in machine design, and he prepared also a number of original papers designed to popularize the subject among American engineers. Wide interest in the question was developed in America. A committee was authorized which developed a standard on the subject, which committee Mr. Schlink served as secretary.

Under his direction and supervision the ASA Information Service has grown from a small, incidental phase of ASA office activities to an efficient and widely used library service.

He has been editor of, and a frequent contributor of original articles to, the ASA BULLETIN, which began in 1923 under his immediate direction as a mimeographed five- to ten-page bulletin for circulation to Member-Bodies and Sustaining-Members.

Through his activities in connection with specifications he became greatly interested in the promotion and use of specifications in the purchasing problems of the consumer. He has given special study to these subjects, and in connection with his duties on the ASA staff has compiled material for use by economists and organizations concerned with standardization on such subjects as specification and standardization work within industrial companies (a series of articles on this subject has appeared in the BULLETIN); possible modes of approach to the problem of standardization of consumers' goods; the role of the distributor in standardization; the role of trade associations; the work of research and testing laboratories in its relation to specifications; and an extensive compilation of information—much of which has appeared in the ASA BULLETIN—on specific pecuniary and other quantitative savings achieved in procurement or in production through the use of specifications and standards.

Mr. Schlink becomes the full-time technical director of Consumers' Research, Inc., an association of ultimate consumers, the aim of which is to act for the consumer in the same capacity as a testing laboratory or as a specification engineer acts for a corporation or for a government department. It was originally formed as a small volunteer organization growing out of the publication of "Your Money's Worth," by Messrs. Chase and Schlink.

For a few months we shall continue to have the advantage of Mr. Schlink's services for one day a week in work on the BULLETIN and in the further development of our Information Service.

P. G. AGNEW

Report of Bureau on Railroad Track Scale Testing Service

The U. S. Bureau of Standards has issued a report on its railroad track scale testing service of interest to plants using such scales. The report, Letter Circular LC 295, may be obtained from the Bureau or borrowed from ASA.

The completion of specifications valuable to track scale users is noted in the report. These include specifications for the repairing and overhauling heavy capacity scales, specifications for railway track scales for light industrial service, and specifications for track scale test weight cars.

The Inspection and Testing of Foods Purchased by the U. S. Navy

by

Frederick Krassner, *Chief Chemist*
U. S. Naval Supply Depot

A description of methods used at the Brooklyn Naval Supply Depot to determine compliance with the Navy's specifications

This article and the article which follows (page 11) will be valuable both to manufacturing organizations and institutions in the preparation of specifications and determination of methods of test and inspection for foods, soaps, and cleansers. Mr. Krassner will be glad to answer questions concerning the subjects of these articles. Such questions may be addressed to the ASA office.

The Navy Department maintains a modern, well-equipped chemical laboratory at the Naval Supply Depot, Brooklyn, where provisions for the various naval stations throughout the country are submitted for tests. A staff of trained chemists occupy themselves with the task of insuring that samples representative of all deliveries of provisions are pure and wholesome, free from adulterants, and in conformity with specific standards of quality. Acceptance or rejection is recommended on the basis of carefully prepared analytical reports from the laboratory embodying the results of tests required to ascertain compliance with the general and detail requirements of specifications.

The requirements, in connection with which all food products are tested, are kept uniformly in harmony with the standards of purity set forth by the United States Department of Agriculture, as well as with trade practices and customs. These specifications are revised periodically to meet the specific needs of the Navy Department and to keep pace with changing conditions in the trade and revised standards.

The general procedure involves the procurement of representative samples of the various food items purchased under contract, which represent the samples of the lowest competitive bidder for each individual item. In some instances samples are submitted in advance in order to ascertain which of the low bidders' samples comply with specifications, award being made accordingly. In other instances where the tests involved are more elaborate and require a greater length of time, award is made to the lowest bidder, who must meet the requirements of specifications in deliveries. Representative samples taken from deliveries made to the various naval stations are forwarded to the Naval Supply Depot in hermetically sealed containers. Samples are similarly obtained from deliveries to the Naval Supply Depot, where a great portion of such products are stored prior to shipment.

The samples are then subjected to physical, chemical, or microscopical tests in the laboratory, where scientific methods and equipment are used in conducting tests. The physical examination involves general organoleptic considerations such as odor, taste, flavor, and appearance, which must correspond to a definite standard of wholesomeness and all foodstuffs must be of the current season's crop. Chemical tests involve the determination of such ingredients as moisture, fat, protein, sugar, starch, acidity, crude fiber, ash, ether extracts, etc., as the case may be. The exact percentages of the foregoing are determined by the latest official methods in effect at the time of invitation of bids. These are the methods included in the book of methods of the Association of Official Agricultural Chemists, including the revisions published in the latest journals of the Association. In the event of a controversy as to results obtained, particularly where a rejection is involved, the matter resolves itself into the question of the method used, the foregoing methods being the ones that govern at all times. It is therefore important for manufacturers dealing with government agencies to be familiar with these. The Association of Official Agricultural Chemists will in the near future publish the newly revised edition of methods.

Canned foods constitute the greatest portion of foods purchased by the Navy, inasmuch as it is easier for ships to carry canned products to sea than it is to load up with the greater bulk of fresh products which involve the problem of refrigeration and storage space. The scientific progress achieved in the art of canning foods

and the variety of canned products available are also factors which are responsible for the widespread use of such products in the Navy. The Navy purchases approximately 20 million pounds of canned foods annually, the quality of which must be determined, and must correspond to a high grade.

Inspection of Canned Foods

The physical inspection of most canned goods, such as fruits, vegetables, meat products, and the like, is conducted by a trained inspection officer and his assistants, the basis of judgment being general appearance and organoleptic tests, as well as comparison with standards when available. Samples of these products are forwarded to the laboratory for such chemical tests as may be required, which often include the determination of artificial coloring matter, artificial preservatives, acidity, density of syrup (balling), etc. Net weights of all canned goods are checked up, and in certain instances the drained weight of solid contents is determined. Such factors as degree of vacuum and head space are also taken into consideration.

Quality in canned foods is best determined by the method of scoring to ascertain the exact grade of the product. The Navy Department purchases mainly the choice grade for most canned goods, so that the deliveries must correspond to the requirements for this grade, which can be definitely evaluated by means of certain standards of quality. In canned goods, quality is dependent on several factors, such as origin and quality of raw products, length of time between picking and canning, conditions of sanitation, and methods of processing. Moreover, there exist marked variations in different packs of any given item, as a result of which definite grades are recognized commercially, viz.: Fancy, Choice, Standard, and Sub-Standard. Each grade has definite characteristics which can be evaluated. For example, in canned vegetables such factors as flavor, consistency, color, clarity of liquor, freedom from split skins, and disintegration are taken into consideration. In canned fruits the significant elements are flavor, size, freedom from blemish, and density of syrup. All the foregoing are matters that can be standardized with a fair degree of precision by canners.

Proposals sometimes include the privilege of requesting that the product which the contractor proposes to furnish be inspected at the plant instead of having such inspection conducted after delivery. Inspections of this nature are classed as field inspection, such inspection at the premises being conducted by an inspector on the same basis as at the Naval Supply Depot. The inspector picks at random a sufficient number of samples to satisfy himself that the products are of the requisite quality. Samples are cut from different parts of the pile as deemed necessary to assure uniformity of the product in compliance with Navy Specifications.

The Navy method of purchase by competitive bids and laboratory tests insures the procurement of products that best serve the needs at the minimum cost. This objective is attained, and at the same time every safeguard against inferiority or adulteration in the various kinds of provisions purchased is exercised. Furthermore, high standards of quality are maintained at all times.

Technical Aspects of the Purchase of Soaps and Cleansers[1]

by

Frederick Krassner, *Chief Chemist*
U. S. Naval Supply Depot

A technical basis for evaluation of soaps and cleansers from the point of view of both manufacture and use

Practically every standard type of soap or cleanser used commercially is used in the Navy. Each type of soap or cleanser is subjected to tests to determine its suitability for the purposes intended, and to ascertain whether specifications have been met. It should be borne in mind that soaps are used for many purposes, and that a soap which may be highly satisfactory

[1] Reprinted from the First Quarter, 1931, issue of *Navy Business*.

for a certain purpose may be unsuitable elsewhere. In evaluating soaps, a number of factors apart from their chemical composition must be taken into consideration. The various types of such products purchased, the specific uses for each type, certain standards of quality, and some of the methods used by the Navy in judging these will be discussed herein. In view of the fact that the matter of cleanliness is of paramount importance in the Navy, and cleanliness is maintained by the adherence to rigid sanitary principles, the important role of soaps and cleansers in accomplishing this objective will be realized.

Manufacture of Soap

While it is not within the scope of this paper to go into the matter of manufacturing details used in the preparation of soaps, brief mention thereof should be made inasmuch as a general understanding of such procedure is of value in connection with judging quality. For instance there are certain allowable foreign substances that are generally present in most soaps, such as water, traces of common salt, sodium carbonate, and a few other minor impurities, that are all incidental to the manufacturing process. The amounts of these, however, as will be pointed out, are limited by specifications.

Soap is ordinarily defined as the salt of a metal, with one of the higher fatty acids. The salts of such metals as sodium or potassium are the ones that are commonly used as cleansers due to their ready solubility in water. During the World War, laws were passed by some of the European governments, defining what could be sold as soaps and soap powders, due to the variety of products that were sold in this category. The Navy Department uses as its guide leaflet specifications, most of which are based upon Federal specifications.[2] The following varieties are listed: castile, chip, grit, and laundry soaps, the latter being divided into fresh water, liquid, and powdered forms. Salt water soap, liquid, white floating soaps, soap powders, and scouring compounds are also included. Among the cleansers are listed: caustic soda (lye), soda ash, and tri-sodium phosphate cleaner.

Soaps are generally made by the action of caustic alkalies on animal or vegetable fats or oils. This action is known as saponification and yields not only soap but also the by-product, glycerol. The so-called graining or boiling and settling process is perhaps the oldest and best known method of soap making. The procedure involves the boiling of neutral fats with caustic alkali until about 90–95 per cent is saponified. Rosin or fatty acids may be saponified by boiling with carbonated alkali. Salt is then added until the soap is grained or salted out of solution and floats as a curdy mass on top, the salt solution containing the glycerol, excess alkali, and other impurities settling to the bottom.

Let us examine some of the principal factors that are taken into consideration in evaluating soaps. The composition of commercial soaps includes, in addition to the alkali salts of the fatty acids and the impurities introduced by the raw materials, certain other substances which are added for purposes such as increasing detergency and cleansing power. These are known as building substances and include such compounds as sodium carbonate, borate, silicate, sand, infusorial earth, etc. When these are added for legitimate purposes and in the amounts specified, they are acceptable additions. When, however, as is sometimes the case, soaps are found to contain adulterants which contribute nothing but weight and are insoluble in water, such ingredients are considered objectionable and their corresponding soaps of inferior grade. Such additions are classed as "makeweights" and are barred by specifications.

The presence of free alkali is tested for in all soaps, inasmuch as an excess of this ingredient is unsatisfactory, especially in toilet soaps, owing to the undesirable effect of free alkali on the skin. In order that a soap may be considered as a neutral soap there must be present just enough sodium oxide to combine chemically with the fatty acids, and there must be present no excess of free caustic soda. Very small percentages are included in specifications in terms of the maximum amount permissible, from 0.1–0.5 per cent, varying with the type of soap, and tests are performed to guard against the presence of any excess. It might be stated that in most deliveries only traces of this ingredient are usually found, indicating that a commercial product containing very little free alkali is readily obtainable.

Soap Moisture Content

Moisture content of soaps is an important factor in their evaluation, and the moisture determination which is included under the heading of matter volatile at 105 C is performed on all deliveries. The fact that most soaps are purchased and paid for on the basis of net weight, renders the exact determination of importance. Of equal importance is the matter of obtaining representative samples from deliveries, such that will thoroughly indicate the actual moisture content of the shipment. In this connection the specifications for the various types of soaps provide for the exact method of sampling, and for placing of samples in hermetically sealed containers prior to test, so that no extraneous moisture may enter. The method followed for

[2] Copies of these specifications may be obtained through the ASA Information Service.

the actual determination of matter volatile at 105 C is also outlined in all specifications. This is true in general of the various other methods used also.

It is apparent from the large quantities purchased, as will be noted from the accompanying figures, that an excess of moisture would amount to an appreciable factor, inasmuch as water is obviously cheaper than soap. Slight variations in moisture content, however, are taken into consideration and corresponding adjustments made. For example, specifications for laundry soap state that:

> "Net weight only shall be paid for, provided the matter volatile at 105 C does not exceed 34 per cent. With deliveries containing more than 34 per cent, but not exceeding 36 per cent of matter volatile at 105 C, settlement shall be made on the basis of 34 per cent of matter volatile at 105 C, that is, sixty-six one-hundredths of a pound of non-volatile matter shall be considered one pound of soap. Examples:
>
> "1. Yield 33 per cent of matter volatile at 105 C pay for net weight.
>
> "2. Yield 35 per cent of matter volatile at 105 C; percentage of net weight to be paid for is calculated as follows: $(100 - 35) \times 100/66$ equals 98.48 per cent."

Matter volatile at 105 C is used as a basis for calculating the percentages of other ingredients present, which for the above type of soap would be computed on the basis of 34 per cent of volatile matter.

General physical characteristics such as odor and appearance of soaps are factors that are taken into consideration in judging all soaps. A rancid or disagreeable odor which might be due to the use of decomposed fat in the preparation of the soap is considered objectionable. Discoloration, such that the appearance of the soap is unsightly, or marred, is likewise unsatisfactory. As regards the actual working or cleansing power of the soap, the exact evaluation of this property is not a simple matter, although in the final analysis this is the most important property of the soap. The general lathering qualities of all soaps are determined roughly in fresh and salt waters, both hot and cold, good lathering quality being an essential requirement that must be met. As a matter of fact, however, there does not appear to be any purely physical test that can be applied in grading commercial soaps, independently of a chemical analysis. This is probably due to the fact that an entirely acceptable theory of the detergent action of soaps has not as yet been established. As a result of experiments in this direction, certain facts, however, that are of assistance in measuring the effectiveness of soap solutions from a comparative standpoint have been established. The property of having a low surface tension, which means that surfaces in contact are wetted quite readily, is a good criterion of detergent power, the lower the surface tension the better the detergent properties of the soap, in general. The addition of sodium carbonate tends to lower the surface tension and accordingly increases detergency, hence its inclusion in specified amounts is permitted in certain types of soaps. However, an excess beyond the specified amount must be guarded against, inasmuch as it is not desirable to purchase soda at soap prices. In connection with ascertaining the cleansing value of soaps, an interesting laboratory method based upon the use of carbon black has been worked out in which the amount of carbon (lamp black) washed through a filter is determined, and the resulting "Carbon Number" taken as a measure of the detergent action. The foregoing test, while not used ordinarily, is sometimes resorted to when a special investigation is being carried out as to the comparative merits of soaps, and is mentioned here in connection with available physical methods for examining soaps. Chemical tests, however, are relied upon mainly and are the tests upon which rejections or acceptances are based. The nature of these chemical tests, other than those previously mentioned, varies somewhat with the type of soap under test.

Testing of Castile Soap

For example, in the testing of castile soap the nature of the oil used must be ascertained, in view of the fact that specifications require a pure olive oil castile. The determination of conformity with this requirement involves the separation of the fatty acids and obtaining certain constants on the latter to ascertain if these correspond to those of pure olive oil. The term castile soap has been subjected to considerable controversy of late before the Federal Trade Commission, due to the fact that the name has been applied, whether rightly or wrongly, to some soaps which contain little or no olive oil soap. There are on the market green olive oil soaps largely used in the textile industry and as the base of some cheap toilet soaps. These soaps are made from a poorer grade of olive oil known as "olive oil foots." The Navy Department, however, specifies a high-grade olive oil castile, for which the sole source of the fatty ingredient must necessarily meet the requirements for pure olive oil. It may be of interest to know that one of the uses of castile soap in the naval service is for washing and cleaning airplane material for which a mild, neutral soap is needed. This soap is purchased in long bars of approximately four pounds each.

Salt water soap is a favorite cleanser on board

naval vessels, as is apparent from the quantities used. The extensive use of this soap is rendered necessary to meet the needs of a soap that will lather readily in salt water and will be less easily precipitated than ordinary soaps. The fatty ingredient of salt water soap is composed entirely of cocoanut oil and tests are made accordingly for the presence of the fatty acids of this oil, as indicated by the constants obtained. The acid number of the fatty acids is characteristic in this respect.

Requirements for Laundry Soaps

A word about modern laundry practices in the Navy might be appropriate here to point out the modern types of laundry compounds used. The various battleships, tenders, colliers, oilers, cargo, store, and ammunition ships in the naval service are equipped with modern laundry appliances, conforming to specifications approved by the Navy Department. Such equipment in general includes washers, extractors, stationary washers, and starch cookers of various sizes, the allowance being based on the complement involved. In line with the foregoing, cognizance is taken of the fact that modern laundry procedure demands soaps that will dissolve quickly and that can be readily added in definite measurable quantities. Chip soaps and powdered soaps (powdered chip soap) fall into this category and correspond to the commercial product used in modern laundries. Ships' laundries are operated under what is known as a ships' service account, standard commercial brands of soaps being purchased for this division. Exact figures of the quantities used in this connection are not available.

The quantities cited in this article are those purchased under regular contract and upon which tests for conformity with specifications are conducted. Chip soap purchased in this manner must be "suitable for high-grade laundry work with soft water. It should be made from fats and soda, without rosin, and be as free as possible from substances other than true soap." The ordinary bar laundry soap is permitted to contain rosin, which increases the lathering qualities to some extent. An excess of rosin, however, is guarded against, due to the stickiness imparted to the soap, and the tendency to harden the fabric washed. Powdered soap is very similar in composition to chip soap, the preparation of this soap differing from that of chip soap only in respect to the final process, which for the latter involves running through granite calendar rolls, reducing the product to thin flakes or chips, or through disintegrators which pulverize it to a fine powder.

Powdered soap should not be confused with soap-powder, which is a soap product containing comparatively large amounts of soda ash, and smaller quantities of anhydrous soap. Both of the foregoing are in powdered form, and differ mainly in that the powdered soap is an approximately 88 per cent neutral soap in powdered form, whereas the soap-powder is a strongly alkaline soap compound. The important constituent tested for in the soap-powder is the amount of anhydrous soap, the minimum requirement for which must be met, it being cheaper to substitute soda for soap. In the large quantities in which this product is purchased this might add up to an appreciable factor.

Scouring compounds are purchased in cakes and powdered form for use in cleaning and polishing glass and enamel, and for general scouring and scrubbing purposes, depending upon the type specified. The laboratory tests for this type of compound include among other things examination of the abrasive material used, which must be of a certain fineness and, depending on the type, should consist of either quartz or feldspar, the former being more economical but also coarser and not as suitable as the latter for scouring fine articles.

There are also specifications for white floating soaps which are used to some extent in the naval service. This soap is purchased in five-ounce cakes, wrapped and unwrapped. The requirements for this type of soap state that it shall be a "high-grade cake soap . . . with 25 to 30 per cent of cocoanut oil, thoroughly saponified, and so prepared as to float on water." Such soaps obtain their floating ability, by virtue of the air or other gases blown into the soap in the process of manufacture. Air is beaten into the molten settled soap until the aeration is sufficient to cause it to float. The soap is then chilled and cut into cakes.

Cleansers Tested for Alkalinity

Among the cleansers, soda ash and lye are purchased in large quantities for a variety of cleaning purposes where these are suitable. Total alkalinity is mainly tested for in such products. Recently, tri-sodium phosphate cleanser has been introduced to be used for cleansing purposes where abrasive action is not desired, such as for cleansing painted surfaces, metals, floors, and a variety of other things. The introduction of this product as a regular item was in response to the many requests from manufacturers selling widely advertised cleansing compounds containing as the basic ingredient tri-sodium phosphate. The specifications as drawn up are intended to cover a cleanser having the essential composition of the tri-sodium phosphates on the market. The amount of tri-sodium phosphate is the important constituent tested for, which must be present in a definite minimum expressed as phosphoric anhydride.

Brief reference should be made to the amount of soap that is considered satisfactory generally in practical usage for efficient results. Experiments have shown that it is a waste to use soap in a much stronger solution than 0.4 per cent. These experiments, which were conducted by the National Laundry Owners' Association along the lines of determining the effect of different amounts of soaps on the stability of fine suspensions, have shown that there is a maximum effect at 0.2 or 0.3 per cent. In line with the foregoing, it might be of interest to mention that standard laundry formulae containing approximately the above concentration of soaps, are used in conducting "washability" tests on a miniature scale in the chemical laboratory at the Naval Supply Depot. An apparatus known as the Launderometer is used for this purpose in connection with the testing of various textiles for fastness to washing, the formulae being those adopted by the American Association of Textile Chemists and Colorists.

The purchase of soaps and cleansers under specifications necessitates sampling and testing, which are somewhat costly operations. It is therefore, in general, of special value only when the amounts purchased are large. When smaller purchases are made and facilities for testing are not available, it is perhaps more economical to pay a slightly higher price for a desirable brand rather than incur the expense of testing a product at a low price. All deliveries of soaps and cleansers purchased under regular contract by the Navy are subjected to tests which are clearly defined and included in Navy specifications for these items.

Purchases for commissary stores and ships' stores are made separately on the basis of acceptable brands.

Federal Specifications Being Revised in Form

One of the most important Federal specifications from the standpoint of its economic effect upon government purchases, according to reports of the Bureau of the Budget, is that for Water-Resisting Spar Varnish. This specification, FSB 18b, which was established August 7, 1926, is now undergoing revision of form in accordance with the ruling of the Federal Specification Board in December, 1929. This ruling requires the revision in form of all Federal Specifications in order that there will be included in each specification both technical and purchase requirements, and that the editorial arrangement will be standard. Further, as new specifications and revisions of existing ones are authorized for promulgation, they are printed at the Government Printing Office, Washington, D. C., and are obtainable from the Superintendent of Documents at that address at the usual cost of five cents. Copies of the latest revised index of Federal Specifications may also be procured at the above address at five cents each, cash to accompany order.

The specifications for interior varnish, and paint thinner for semipaste paints (sometimes known as Japan oil, or paint oil) are also being subjected at this time to similar change. Those especially interested in any of these subjects may wish to borrow a copy of the proposed revision of form from ASA.

Iron Trade Review Reports Benefits of Standardization

Benefits achieved from standardization by the Herman Z. Cutler Company, Incorporated, of Camden, New Jersey, are noted in an article, "Research Proves Valuable as Aid to Sales," which appeared in the September 18 issue of the *Iron Trade Review*. This company, which manufactures stampings, has been able

> "to evolve standardized parts, with the result that production costs have been lowered. For instance, the company recently designed a standard crown fender whose lines harmonize with the larger tires now in general use. For producing this fender, only one die equipment is required. The fenders are so designed that they may be stamped out in large sizes and cut down to the size required. Such standardization, of course, not only brings about a saving in the investment in dies and fixtures but also a saving in time consumed in changing dies and fixtures. It also makes possible quicker deliveries to customers."

The same issue of the *Iron Trade Review* contains a comment by E. C. Kreutzberg, Eastern Editor of *Steel*, on the standardization of manholes and covers, a project which is now in process of development under ASA procedure. Mr. Kreutzberg points out that each city has its own ideas as to the size and construction of manholes and covers.

> "Standardization in this direction," he says, "not only would provide an outlet for a large tonnage of floor plate in the aggregate each year but also would decrease the cost of manholes and their covers to municipalities throughout the country."

The Use of Specifications as the Basis of Contracts for the Sale of Coal

by

R. A. Burrows and N. Simpkin

A discussion of the types of specifications for coal required for the guidance of buyers and sellers

The following article is an extract from the paper, "The Sale of Coal under Specifications," by R. A. Burrows and N. Simpkin which was presented before the World Power Conference at Berlin in June, 1930. Although the paper is based directly upon conditions in Great Britain, there will no doubt be many observations which it includes that have an application to coal purchase problems in the United States.

It is only in recent years that the works engineer and the works chemist have been called in by the buyer to advise him as to the efficiency of his plant and as to the most suitable coal to use. Knowing that the buyer now sets up a standard in nearly every case, it is obviously to the advantage of the seller that the standard so established should be one to which he is a party. . . .

Practically all buyers test their coal bought on contract. If by any chance the coal supplied is better than the sample on which the buyer made his contract, nothing is said, but if it falls below the standard which has been set up by the buyer (without any reference to the seller) there is trouble.

The progress of scientific buying has been accelerated in recent years by the growth of large combines and corporations, which by reason of their size have found it worth while to establish a buying department with a technical staff. These technical experts, acting on behalf of their company, have evolved a system of testing and evaluating all the coal received, and have formed for themselves standards by which all supplies are graded, depending upon the purpose for which the coal is required. All large consumers test the coal as received in order that the standards on which they buy may be maintained. . . .

The argument is sometimes advanced that coal, being so variable in quality, cannot be maintained at any fixed standard and therefore should be sold at a uniform price. This, however, is actually an argument in favor of a specification with a sliding scale of bonus and penalty, since only by such means does the price paid bear a true relationship to the value of the material supplied.

It is, of course, very difficult to maintain a regular quality in an unwashed fuel, especially small coal such as slack. Here the quality is to some extent outside the control of the producer, although much can be done by discouraging the loading of dirt with the coal, but it is obviously unfair to expect the buyer to pay the same price for a deteriorated article, even though the deterioration has occurred owing to natural causes. The ultimate remedy is, of course, to pass the coal through some type of purifying process in order to eliminate the dirt and produce a more uniform grade.

If it is decided to purchase according to a specification, the onus of drawing up the specification obviously falls in the first place upon the consumer, since he requires a coal of certain qualities to suit his particular purposes. Hence, he must first have in view what might be termed a differentiating specification covering all the points which are necessary in order to exclude or include coals of any type. It is not suggested that a specification of this type should form the basis of a contract, but should merely serve as a guide to the coal factor or producer to indicate the general type of material required. When, as a result of experience following tests upon certain coals the consumer decides upon one particular type, a specification to form the basis of a contract between buyer and seller can be drawn up. Such a specification may differ considerably from that mentioned above and need not as a rule be so comprehensive. It must, however, include all the necessary items in order to avoid misunderstanding.

It has been suggested that coals should not be bought on a specification but on their actual performance under conditions for which they are to be used. It must be pointed out that the two proposals are not alternatives. A buyer would not contract, at least on a large scale, on an analysis alone but on previous experience and on the result of practical tests on his plant. Having selected one or more coals from such

tests, the specifications are drawn up and the basic standard of guarantee of the fuel fixed, preferably from the results obtained from a series of previous analyses.

In Great Britain there has been, and still is, a general disinclination on the part of both buyer and seller to draw up a specification to form the basis of a contract. The reasons for this are many.

It is impossible to brand or label coal, and, therefore, collieries anxious to maintain a high quality in their products are always at the mercy of intermediaries who may substitute inferior fuels, or mix lower-grade fuel with the better. Hence, they should welcome the assistance of the buyer in instituting periodical tests which tend to check abuses. By performing such tests at the colliery, the producer has immediately an answer to any complaints made and so protects himself from unscrupulous intermediaries or from frivolous complaints. The expense of sampling and testing consignments of coal is infinitesimal as compared with the value of the commodity.

It does not appear impossible to the authors that at some future date all coal will be sold to a specification, and inspectors will be appointed to test all deliveries on behalf of the buyer and seller jointly. It should be remembered, however, that the quality of a coal can never be expected to be maintained rigidly to a standard like manufactured products, and therefore a sliding scale of prices or a suitable alternative must be a necessary concomitant of selling under specification. Especially in the case of dry-slack, as has been said, it is beyond the control of the colliery manager to produce such fuel constant in quality, and the same applies in a less degree to a washed fuel.

The whole of the system of buying and selling coal to specification depends upon the results obtained from analyzing the coal. In the first place, it necessitates suitable provision being made for sampling the coal both by the supplier and the consumer, followed by the analysis of the samples obtained. For satisfactory agreement between the contracting parties, the question of sampling and analysis should be thoroughly discussed before the contract is drawn up.

It is not within the scope of this paper to enter into details of the best methods of sampling, but it is desirable at this point to lay particular stress upon the need for the sampling arrangements to be such that the sample obtained will represent what it is intended to represent. Without this, the subsequent analysis is practically valueless, whilst the calculation of penalty or bonus will be totally erroneous.

It would appear that the difficulties of obtaining a representative sample are not generally realized, and samples are frequently taken purporting to represent a certain consignment whilst actually they do not. Again, the duty of obtaining samples is not infrequently placed in the hands of an operator who does not fully appreciate and understand what he has to do, and however conscientious he may be he fails in his work through lack of instruction. It is suggested, therefore, that if the actual method of sampling is not included in the terms of the contract, there should be a definite understanding between the contracting parties as to the method to be adopted.

Methods of Analysis

Following upon the sampling, and assuming that a representative sample has been obtained, the methods employed for analysis should also be agreed upon. Here again it may be considered advisable to state definitely in the terms of the contract the method to be used for performing certain of the tests. Without this, and in view of the fact that no definite standard methods are recognised and adopted by all concerned, disagreement in the analytical results may readily arise due to the use of different methods. It is only necessary to cite the determination of the calorific value or of the volatile matter. In Great Britain, these tests are in certain cases being performed by chemists with apparatus which does not receive general acceptance or which is known to give results which only approximate roughly to the true values.

Unfortunately, there has arisen in Great Britain a somewhat misleading expression, namely, the selling of coal on a calorific value basis, which completely ignores any other qualities which it is desirable the coal should possess, and tends to imply, particularly to the uninitiated, that calorific value is the only item to be included in a specification. Very brief consideration will show that a contract drawn up with a specification embracing calorific value only is of little real value and, moreover, is open to so many objections that it should be avoided. It might, however, be regarded as the first step in the change from the sale of coal on a fixed price basis to sale under specification. Obviously, the next step is to make the specification more comprehensive and definite, including moisture and ash figures in addition to calorific value.

As a typical example of such a contract, the method in use by the Fine Cotton Spinners' and Doublers' Association, Ltd., may be instanced. This association, which has an authorised capital of £10,000,000, comprises 46 associated firms, embracing nearly 100 mills. The quantity of coal bought under specification is approximately 250,000 tons (of 2,240 lb) per annum. Contracts were commenced in 1923 and have been so successful that at present

almost the whole of the coal purchased by the Fine Cotton Spinners' and Doublers' Association, Ltd., is bought on these lines. It is obvious that when the coal is to be used for other purposes it may be necessary to include other terms in the contract such as the maximum permissible figure for sulphur, phosphorus, salt, etc., the melting point of the ash and the percentage of volatile matter; in fact, one can conceive cases where some of these latter figures are of much greater importance than, say, the calorific value of the coal.

The authors are not aware of any contracts based on a specification with a sliding scale of bonus and penalty operating in Great Britain for the purchase of coal for gas manufacture, coke making, or industrial purposes other than steam raising. It must not, however, be inferred that gas and coke companies do not test their coal. As pointed out, the tendency has been for the buyer to purchase to his own specification at a fixed price, giving no credit for improvement in quality, but complaining if the quality falls.

The Ideal Specification

The points mentioned above introduce the problem of what is an ideal specification and what terms should be included. It must be stated at the outset that the answers to these questions depend principally upon the use to which the coal is to be put. Other points which also influence the terms are: (1) whether the specification is of a general nature, inviting tenders, or whether it is to refer entirely to a contract between two parties for the supply of a particular fuel; and (2) the knowledge which the buyer has of a particular fuel which experience has proved to be suitable for his purposes.

Particular care should be taken to guard against the drawing up of what might be termed an under-specified contract or, on the other hand, a specification containing too many terms referring to the quality or property of the fuel. Only such terms should be included as are deemed necessary since otherwise the specification may be rendered too complicated. It is, of course, the duty of the buyer to make certain that his requirements are fully covered by the specification. At present, the amount of coal bought and sold in Great Britain under specification is comparatively small, but there is a general tendency for this method to increase, and the time may not be far distant when most large contracts will operate in this manner.

It is necessary in the first place to define the coal to be supplied and its size. This may be done by including: (a) name of seam or coal; (b) the colliery; (c) the size of coal; and (d) whether washed or dry. On first consideration this may appear to cover the general definition of the fuel, but in some cases it may be open to very serious criticism and without full consideration and discussion, preferably between the buyer and the seller, such a definition should not be agreed upon.

Variations in Quality

(a) It is well known that the nature and quality of seams vary from place to place, sometimes even in the same pit. This variation may be slight or inconsiderable, and the quality of the coal actually brought out of the pit is also influenced by the method of working, the presence of dirt bands in the coal and the nature of the roof and floor. It is customary at some pits to mix the coal from two or more seams in order to avoid duplication of screening and cleaning plant or delay in handling the product from one seam. In this case, the mixture may be given a name which implies the presence of only one seam and may mislead the buyer. It must not be assumed that the authors decry the practice of blending seams. The one objection to such a scheme is the haphazard mixing of two or more seams in proportions which vary considerably from day to day. The problem is one for the management of the colliery to solve, for the salesman, without knowledge of the variations to be expected, might find himself involved in a very awkward position when arranging a contract to a specification. From the buyer's point of view, the sale of the coal under specification serves as a protection against fluctuations in quality.

(b) Designation of the colliery may or may not be necessary or advisable. In the case of large firms working the same seam at different places, they should be aware of any differences at the various pits. The practice is also arising of concentrating output of two or more pits at one central purifying and screening plant, so that only one series of grades is marketed from a group of pits instead of a separate series from each individual pit.

(c) The name given to the size contracted for should leave no ambiguity as to what is meant. It may be stated here that two "$1\frac{1}{2}$ in." slacks will probably differ very considerably from each other with respect to the amount of various sizes, e.g., $1\frac{1}{2}$ to $\frac{3}{4}$, $\frac{3}{4}$ to $\frac{1}{2}$, $\frac{1}{2}$ to $\frac{1}{4}$, $\frac{1}{4}$ to $\frac{1}{16}$, $\frac{1}{16}$ to 0 present, irrespective of the fact that the shape of the $1\frac{1}{2}$ in. hole may be different.

(d) With the advent of dry cleaning plant for coal, the use of the terms "washed" or "dry," as designating, respectively, a cleaned coal and an uncleaned run-of-mine, screened (possibly picked) coal, may be ambiguous. A "dry" coal may consequently be purer than a washed coal and have the additional advantage of a lower moisture content.

The subsequent details of the specification will

be governed largely by the use for which the coal is intended, e.g., for steam raising purposes, moisture, ash, and calorific value are of primary importance whilst other points such as fusibility of ash, coking qualities, sulphur content, and volatile matter are points which, though of probably less importance generally, cannot be neglected. Their inclusion, however, in the specification would tend to make it very lengthy and it would be wise to consider each contract separately. If, for example, the coal is required for pulverized fuel burners, the fusibility of the ash may be, within limits, of greater importance than the actual amount present, and under such circumstances the inclusion of a clause bearing upon the fusibility of ash may be deemed necessary. Under other conditions a limiting figure might be necessary for the percentage of sulphur present. An undue number of clauses, however, should be avoided as tending to make complications. A buyer should not contract for a coal according to specification without some previous knowledge of the general properties of that coal unless the contract is for a small amount only and the coal is to serve merely as a trial.

For steam raising purposes the calorific value coupled with a reference to ash or moisture contents is usually the clause upon which the bonus and penalty is arranged. Such a sliding scale operating on the variation of, say, four items would be very difficult to arrange and it would be found advisable to fix maximum or minimum values for certain properties of the coal. In the case of coal required for other industrial purposes, it would be necessary to arrange the sliding scale of bonus and penalty with regard to some property other than calorific value, since the possession of, say, a low sulphur content coupled with certain other qualities might be the factors governing the value of the fuel.

Good Faith a Necessity

For the satisfactory operation of a contract based on a specification, the good faith of both buyer and seller is required.

There are as many, if not more, possible means of abuse in the ordinary form of contract as in the contract arranged to a specification. If the sampling is wilfully done so as to be incorrect or if the sample is unadulterated, a corresponding benefit is obtained by either the buyer or the seller. This is, of course, possible but the other party to the contract knows or should know the quality of the fuel from his own tests and such underhand work would soon be detected. Such a thing is possible particularly where the seller is depending solely on sampling and testing performed by the buyer, but in any case any continued need for payment of either penalty or bonus should be investigated by both parties.

Another possibility is the attempt of the seller to send better material than actually contracted for in order to raise the amount of bonus received. This again would defeat its own purpose because the matter would lead to investigation and possibly cessation of the contract or refusal to renew it.

Classification of Coal

The buying and selling of any material according to a specification involves of necessity the use of specific terms relating to size, properties, qualities, or other particulars relating to the commodity in question. Certain commodities may be gaged by either the size, the possession of certain peculiarities, or conformation to definite tests, chemical or physical. Being of such a variable nature (in fact it might almost be said that no two coals are alike though they may appear similar) coal has, until comparatively recently, always been regarded as being in a class of its own. Various attempts have been made to divide coals as a whole into different groups depending upon certain qualities or properties. Such classification has in certain cases been carried out from a chemical aspect alone with the result that the various divisions and subdivisions made have been of use to the coal chemist, but have been disregarded for obvious reasons by the commercial world. The work now being undertaken by the American Society for Testing Materials must be regarded therefore as of extreme importance both to the commercial man and to the scientist alike since it tends to bring about not only a better understanding, but should serve as a useful basis of nomenclature for all concerned.

Since the ideal specification should include a description of the material, a clause as to size, and reference to tests to which the coal should conform, it is obvious that it is to the advantage of buyer and seller to employ throughout standardized terms.

In Great Britain, a vast number of descriptive terms are in use for various commercial grades. As a result, the buyer is confused by the names, proprietary and otherwise, and descriptions of the various grades of coal offered for sale. Further confusion is also introduced by the entire lack of standardization of sizes. It is not suggested that there should be a wholesale replacement of existing plants, but rather a correlation of sizes and an attempt to limit their number. The question of standardization of size is of importance chiefly to the big consumer, but the results would be of general benefit. Take as one instance the use of the term "two-inch nuts." There is at present nothing to suggest the shape of the hole in the screen through which the coal passes, i.e., square, rectangular, or round, or even whether the material is limited by a maximum or minimum size. Provided the number

of standardized sizes were sufficient for the needs of the industry and the descriptions of such sizes were carefully defined, the new system would be preferable to the old one. Progress has been made along these lines in some of the coal fields of Great Britain, particularly in the North Staffordshire area. In some of the American coal fields work of a similar nature is being carried out. Before adopting either standard sizes or standardizing the screen plant, the fact must be considered that different coals vary in fragility, and the percentages of various sizes yielded by a number of coals on being broken up, either as a result of mining operations or by subsequent treatment, may differ very considerably.

The question of standardizing methods of analysis of coal is a problem which has engaged the attention of fuel technologists in many countries. Obviously, the general recognition and adoption of such or similar standards would be of vast importance alike to the contracting parties arranging a specification and to the chemists who are responsible for the analytical work connected with it. It may be argued that chemical tests are expensive and intricate and that some very much simpler methods than those recommended should be employed. This is perhaps true, to some extent, but in many cases the so-called simple tests are actually no simpler than other tests, which have the advantage of giving far more reliable results and using methods which are generally recognized. It is very necessary, therefore, that national and even international methods for sampling and analysis should be agreed upon.

Salesmen Need Instruction

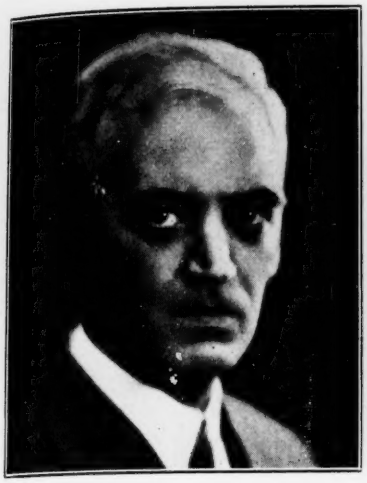
The introduction of specifications as applied to coal, together with the accompanying chemical analyses, has resulted in a new terminology as far as the purely commercial man is concerned. Both buyer and salesman, therefore, must receive a certain amount of scientific instruction in order to appreciate the significance of the new method of arranging contracts. A salesman should be in a position to produce analyses of the various grades of coal he has to sell, and should be able, from the requirements of different industries, to recommend certain of his grades for particular purposes. Hence, he should have a knowledge of the various industries which consume coal and the reasons why coal for a particular purpose should be possessed of certain properties. A knowledge of the possible variations in the quality of any particular grade would be invaluable, but this point does not seem to be realized by the coal industry. It is suggested that maintenance of a standard quality in each grade is of paramount importance. What is required, therefore, is a better understanding between the man at the pit responsible for producing the various grades of coal and the salesman who has to dispose of them. Any complaint from a customer in this respect should be promptly and fully investigated at the colliery. One point must be especially emphasized. It is useless for a salesman to be supplied with figures purporting to represent the various grades he has to sell but which are actually nothing more than the analyses of picked samples, the quality of which cannot be maintained.

In conclusion, it may be said that contracts based on specifications tend to result in the maintenance of a higher standard of purity in the coal, and also to tend toward a better understanding between the supplier and his customers. Naturally an up-to-date colliery aims at keeping a high standard just as any other industrial concern and it is only by such means that satisfactory progress and trade can be maintained.

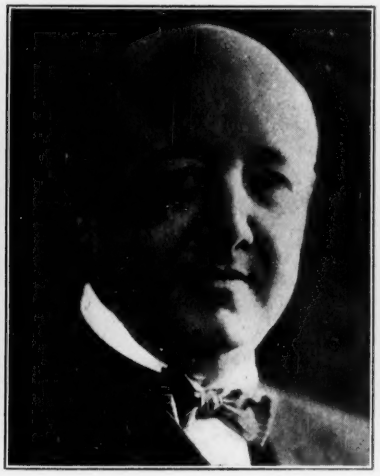
Editor Urges Standardizing Parts of Radio Sets

The standardization of components of radio receiving sets is urged by William G. Many, Eastern Editor of *Radio Industries*, in an article "Efficiency! The Vital Keynote of 1930 Radio" in the October 16 issue of *Iron Trade Review*.

> "Since there is scarcely a set manufacturer who makes all his own parts without selling any of those parts to other set manufacturers, we can see few reasons why certain items of receivers cannot be standardized. Of course, there are reasons. But the fact remains that the reasons for standardization of parts far outweigh the reasons against. Scientific tests enable us in most instances to arrive at definite conclusions. The one other factor is cost. Differences in costs may be secured by different quality of materials and precision, but all made to the same specifications. In the automobile industry tire manufacturers can manufacture standard sized tires with complete confidence that car manufacturers will not change those standards, and that all car manufacturers will adhere to those set standards. But that does not keep one tire manufacturer from making a cheaper grade of tire than another.
>
> "Just so in the radio industry, the adoption of standard specifications would enable cheaper production of components and at the same time allow room for price variations in accordance wth factors other than specifications."



John C. Parker



F. E. Moskovics

Robert J. Sullivan

Chairmen of ASA Committees for 1931

Mr. Parker is chairman of the Committee on Procedure; Mr. Moskovics is chairman of the special Ways and Means Committee; and Mr. Sullivan is chairman of the Committee on Finance.

Officers and Members of ASA Committees Appointed

The completion of appointments of officers and members of the ASA Committees on Finance, Procedure, and Ways and Means has just been announced. The appointments for the Committee on Finance and the Committee on Procedure are for the term of one year, while that for the special Ways and Means Committee is for an indeterminate period until the work for which the committee was organized is completed.

R. J. Sullivan, Vice-President of the Travelers Insurance Company, Hartford, Connecticut, is chairman of the ASA Committee on Finance for the coming year. The other members of this committee are:

Quincy Bent, Vice-President, Bethlehem Steel Company, Bethlehem, Pa.

W. J. Serrill, the United Gas Improvement Company, Philadelphia, Pa.

New members of the ASA Committee on Procedure have been appointed by the Standards Council as follows:

J. C. Parker, Vice-President of Engineering, Brooklyn Edison Company, Brooklyn, N. Y., *chairman*

G. H. Rock, Rear Admiral, U. S. Navy, Assistant Chief Bureau of Construction and Repair, Washington, D. C.

A. Maxwell, National Electric Light Association, New York, N. Y.

S. L. Nicholson, Westinghouse Electric and Manufacturing Company, New York, N. Y.

A. W. Whitney, Associate General Manager, National Bureau of Casualty and Surety Underwriters, New York, N. Y.

A special Ways and Means Committee to consider plans for the permanent financing of the American Standards Association has been appointed by the president, as authorized by the Board of Directors at its meeting of December 11. The committee as appointed is composed of the following members:

F. E. Moskovics, President, Improved Products Corporation, New York, N. Y., *chairman*

Howard Coonley, President, Walworth Company, Boston, Massachusetts

L. A. Downs, President, Illinois Central Railroad, Chicago, Illinois

R. J. Sullivan, Vice-President, the Travelers Insurance Company, Hartford, Connecticut.

Standards Year Book

The Bureau of Standards has just published the 1931 *Standards Year Book*. Members may obtain copies through ASA or from the Superintendent of Documents at $1.00. A review of the book will appear in the April ASA BULLETIN.

Progress in Standardization of Highway Purchases[1]

by

W. A. Van Duzer *President*,
American Road Builders' Association

If the specifications covering supplies, material, and equipment used by the different highway authorities could be standardized, the benefits derived would more than recompense the effort and expense necessary to bring about such standardization. It is obvious that the large majority of purchases, especially in the equipment line, cannot be completely standardized; nor would it be advantageous to carry standardization too far, and thus retard improvement in designs.

No one would care to make the statement that any particular design offers no opportunities for improvement. There are many items which, however, we believe could be standardized with much benefit. Among the benefits would be the following:

The manufacturers, knowing that the different states and counties would require materials covered by the same specifications, could manufacture such materials throughout the year, stocking them during the dull seasons. This would have a tendency to stabilize industry and would permit a more economic production, which should be reflected in the purchase price.

If materials were standardized, deliveries could be made promptly and costly delays would be avoided.

In case of emergencies, the highway departments would be able to obtain material meeting their specifications and requirements. At present it is often impractical to wait until such materials can be obtained, and consequently substitute and often inferior materials are accepted in order that the work may not be delayed.

By promulgating standard specifications, better materials and equipment can be obtained. As an example of this we would cite the 10-gallon caretakers' heating kettles as they were sold by the leading supply houses four or five years ago. These kettles were made of light-gage sheet steel which was too thin to lend itself to welding. Consequently, the spouts and seams were riveted and almost invariably leaked when new. In addition to this, the kettles were so light that a rough handling soon had them out of shape and unserviceable. About four years ago we drew up specifications increasing the gage of the metal and specifying that all joints should be welded. Practically all the manufacturers adopted these specfications and now the heavier kettles can be purchased from any of the supply houses handling this class of equipment.

Standard specifications have also been of benefit on road drags. For years we purchased road drags on competitive bids. Different manufacturers emphasized special good points about their particular drags. Two years ago we went into this matter carefully and made a drawing of a standard road drag. In doing this we embodied the really worth-while points in all the drags, adding weight and strength where required. We submitted these drawings to the different manufacturers of drags and obtained competitive prices. The drags we purchased cost very little more than we had been paying for an inferior product and not only gave us a very efficient drag but also made all parts interchangeable. As soon as the entire state is equipped with these drags, confusion relative to the purchase of drag blades and repair parts will a thing of the past.

This brings up the point of cutting-edges for graders. A survey about two years ago showed that while we had graders with four different lengths of blades, it required 54 different cutting-edges to supply our needs. This was due to the different shapes and different punchings furnished by the various manufacturers of road graders. About that time we adopted the standard recommended by the Standardization Committee of the Mississippi Valley Association of State Highway Departments. Now all graders purchased are equipped with mound boards punched to take these cutting-edges. As soon as our old machines are worn out, the purchase of cutting-edges for graders will be be simplified.

Another class of equipment that lends itself well to standardization is snow-fence. At

[1] Reprinted from *The American City*, November, 1930, by permission of the editors.

present, practically the only difference in the specifications of different states covering snow-fence is that some of the states specify No. 12½ wire while others specify No. 12. There is also a slight difference in the test of the galvanizing on this wire. Consequently, snow-fence manufacturers, of whom there are only five or six in the country, are unable to manufacture fence for the different departments until they have been definitely awarded the contracts. This often leads to delays in furnishing the equipment. We minimize the delays by advertising early in the year, usually in June. However, if the different states had the same specifications, we are quite sure that we should obtain better prices and prompter deliveries, and that the manufacturers would be better satisfied.

This also might apply to corrugated pipe. At present, pipe manufactured to the specifications of some states will not be accepted by Pennsylvania on account of the specifications relative to riveting and width of the lap. When we require pipe on short notice, we are often compelled to wait until such pipe can be fabricated, while if the specifications of the different states were standardized, such pipe could be shipped directly from stock.

The specifications covering crushed stone as promulgated by the different states give a good example of wasted effort and money on the part of the stone producers. For instance producers who are shipping interstate business and have orders for two or more states must change their screens in order to meet the grading requirements of the different states. They do not dare to stock a large quantity of stone for fear they will not be able to dispose of it. Very few of the stone producers have space to stock the different sizes as required by different states.

We see no reason why specifications covering bituminous materials for surface treatment, penetration, etc., cannot be standardized, and there is every reason to believe that if they were, the highway departments and the producers of such materials would be mutually benefited.

The same applies to paints used especially for highway purposes, such as traffic paint, guard-rail paint, sign paint, etc.

In the higher class of equipment, such as trucks, standardization is rather a difficult problem to solve. We have standardized on dumping-equipment for manually operated dump-bodies, the principal idea being to obtain a dump-body that will be safe in operation—one that cannot run down and injure the operator by flying crank or wheel. Three years ago when we insisted on this type of equipment, there was only one manufacturer who produced a dumping arrangement that met our specifications. Today, however, there are at least four that comply with our specifications regarding safety.

On various other items of equipment complete standardization is impracticable. It is our practice to draw specifications for such equipment sufficiently tight to exclude equipment that we know is not suited for our purpose, and sufficiently open to accept all other equipment. This, we believe, should be the purpose of all specifications. To date, there has been very little concerted effort on the part of the different highway departments to attempt standardization or to cooperate or coordinate in the promulgation of specifications.

Cooperation Will Bring Standardization

We believe that if the testing divisions, the equipment divisions, and the purchasing divisions of the different states would give this matter careful and serious consideration, much benefit would result. At first, it might be opposed by the manufacturers, but we believe that if the matter were properly handled, their objections could be overcome by the potential benefits to be derived by them through such standardization.

The American Road Builders' Association, recognizing the benefits to be derived from standardization of purchase and standardization of equipment models, appointed a committee about two years ago to work in conjunction with a similar committee appointed by the Associated General Contractors of America to prepare a depreciation schedule on equipment. This committee made a progress report at the annual meeting of the American Road Builders' Association in 1929, showing the rates of depreciation on practically all kinds of equipment used in highway construction. The final report was made at the Atlantic City meeting of the Association last January, and these schedules are now available.

The American Association of State Highway Officials and the American Road Builders' Association appointed a joint committee, of which the writer was chairman, to work out a method of standardization of purchase. A report was made last year, and the committee will continue during the coming season.

There was also appointed a joint committee of the American Association of State Highway Officials and the American Road Builders' Association to standardize the construction of weighing-devices for fine and coarse aggregates for concrete, which has been adopted as standard by the two Associations.

It is proposed to continue these studies during the next year and to make recommendations which will help the equipment manufacturers as well as the road authorities in determining set standards for each piece of equipment used in highway construction.

German Standard Specifications for Belting Explained in Official Publication

The initiation of an ASA project for the preparation of standard specifications for leather belting lends special interest to an article entitled "For the Information of the User of Leather Belting" in the October, 1930, issue of RKW-Nachrichten, the official publication of the German Council on National Economy (Reichskuratorium fuer Wirtschaftlichkeit). The following is a digest of the article:

The German National Committee for Purchase Specifications (Reichsausschuss fuer Lieferbedingungen) established, in 1927, purchase specifications for leather belting. These have been criticized and this article was written to remove the impression that the purchase specifications in question had become obsolete. It is pointed out that these specifications are still in force although efforts are being made to revise the wording and to make the definitions sharper. Furthermore, efforts are being made to establish standard methods of test in order to enable the buyer reliably to check the belting as to quality. The article grants that no ideal solution has as yet been found, and that these specifications simply represent the first step in the right direction. Reference is made to a discussion entitled "Leather Belting and Technical Leather Goods," published in a German trade magazine in August, 1930. An abstract of this discussion is given, reference being made to three important factors in the manufacture of belting, viz: the nature of the raw material, the tanning process, and the method of assembling the belts from the portions of the hides. The tanning, according to the discussion, may be performed slowly in the natural way or it may be speeded up artificially, the former method taking eight to nine months and the latter as little as two weeks, if necessary. Artificial tanning results in a swelling of the hide so that there are fewer fibers per unit of volume than in leather that has gone through the time-consuming natural process. The discussion states that only the leather which is tanned slowly has the elasticity required for leather belting. Not the ultimate strength, but the elastic limit, is the most important factor.

With regard to the preparation of the leather, the discussion says that the hides may be greased in cold condition by spreading the grease as a paste on the outside of the raw leather, or the dry leather may be dipped into a hot bath of grease. In the former case the leather absorbs only so much grease as is required for the purpose of suppleness and durability. In the latter case the leather can absorb up to 35–40 per cent of grease. It is soaked with grease and thereby swells, thus acquiring a greater thickness without, of course, having any more fibers than the cold-greased thinner leather. In order to camouflage this excessive greasing, the leather is bleached artificially, principally with oxalic acid or sulfuric acid. However, these acids have such a close affinity with the fibers of the hides that they cannot be entirely removed by subsequent washing of the hides with water. Therefore, as the acids destroy the leather slowly but surely, all of these bleached leathers carry the germ of destruction in them. The greater the velocity of a belt in operation, the greater its contact with the oxygen of the air and the quicker the acid acts to eat away the fibers of the leather until the belt breaks, the discussion concludes.

The article then goes on to say that the experiments carried out independently by two professors have shown that the quality of performance of a cold greased belt, according to RAL Class III (specifications established by the German National Committee for Purchase Specifications), may be as much as 30 per cent greater than that of a belt of RAL Class I.

The article in addition deals with the art of properly assembling the parts of the hide most suitable for producing a good quality of belting.

New Members of Committee on Petroleum Products

The following new members representing the American Society for Testing Materials have been included in the personnel of sectional committee Z11, Petroleum Products and Lubricants:

H. E. Smith, New York Central Lines, New York City

H. P. Rue, Refinery Engineer, U. S. Bureau of Mines, Laramie, Wyoming

Zeno LeTellier, Lindsay-McMillan Company, Milwaukee, Wisconsin

Mr. LeTellier replaces R. N. Jarman, formerly representative of the A.S.T.M. Mr. Rue and Mr. Smith replace W. T. Sieber and V. H. Manning, also formerly representing the A.S.T.M. on the committee.

ASA PROJECTS

A Review of Civil Engineering Projects under ASA Procedure

The fifth of a series of reviews of standardization projects under the procedure of the American Standards Association

The status of all civil engineering projects developed or in course of development under ASA procedure is summarized in the following review. The data presented are taken from the files of the American Standards Association and are corrected to March 1, 1931. The personnels of the sectional committees handling the projects may be found by reference to the project section (A) of the 1930 American Standards Year Book (pages 31–39).

A1-1928—Specifications for Portland Cement

Chairman—W. K. Hatt, Professor of Civil Engineering, Purdue University, Lafayette, Ind.

Secretary—W. M. Kinney, General Manager, Portland Cement Association, Chicago, Ill.

In 1921 the specifications for Portland cement of the American Society for Testing Materials were approved by ASA as an existing standard. The A.S.T.M. accepted sole sponsorship and organized a sectional committee under ASA procedure to take care of future revisions. The membership of this committee, consisting of the A.S.T.M. Committee C1 on Cement which had developed the existing standard, was expanded to make it more representative.

In 1928, revised specifications were approved by ASA, and a further revision of the standard was submitted quite recently. Although no decision on approval has as yet been taken on this matter by ASA—pending supply of additional data by the sponsor—the 1928 edition of the standard has thus been superseded.

A2-1926—Fire Tests of Building Construction and Materials

Scope—Fire test methods applicable to assemblies of masonry units, composite assemblies of structural materials for buildings, including bearing and other walls and partitions, columns, girders, beams and slabs and composite slab and beam assemblies for floors and roofs, and to other assemblies and structural units which constitute permanent integral parts of a finished building; method of classification of building members on the basis of such tests.

Chairman—R. P. Miller, Consulting Engineer, New York, N. Y.

Secretary—Fitzhugh Taylor, Underwriters' Laboratories, Inc., Chicago, Ill.

These specifications, submitted by the American Society for Testing Materials to ASA as an existing standard, were approved as an American Tentative Standard in 1919. The American Society for Testing Materials, the Bureau of Standards, and the ASA Fire Protection Group were appointed joint sponsors and organized a sectional committee to take care of future revisions of the standard. In 1926 a revision of the standard worked out by the sectional committee was approved by ASA as the present American Tentative Standard (A2-1926).

A3a—General Specifications for Steel Railway Bridges

A3b—Specifications for Design and Construction of Steel Railway Bridge Superstructure

A25—Specifications for Movable Railway Bridges

Scope—General and particular requirements for the design, equipment, and materials of movable railway bridges, including loading, stresses, and proportioning of parts.

A34—Specifications for Design and Construction of Steel Highway Bridge Superstructure

In 1923 and 1924 the four above specifications were submitted to ASA for approval as existing standards. Specifications A3a and A25 had been developed by the American Railway Engineering Association, and A3b and A34 by the American Society of Civil Engineers.

A special committee, appointed to advise ASA regarding the approval of these specifications, recommended in 1925 that the unification of

specifications for steel railway and highway bridges should be undertaken by the sectional committee method under ASA procedure and that the American Railway Engineering Association and the American Society of Civil Engineers be invited to act as joint sponsors. ASA approved the former recommendation but deferred action on the latter upon request of the A.R.E.A. representative, pending further discussion of the matter in his organization. No sectional committee has been organized, but since 1927 a joint committee of the A.R.E.A., the A.S.C.E., and the American Association of State Highway Officials has been trying to reconcile the specifications. In 1928, the committee submitted a report to these organizations for discussion. The organizations have indicated that it is not their desire to withdraw the projects, but to have them held in abeyance pending the outcome of the continued discussions.

A5-1930—Method of Test for Toughness of Rock

Submitted by the American Society for Testing Materials as an existing standard, this method of test was approved by ASA as an American Tentative Standard in 1921, the A.S.T.M. being appointed sole sponsor. Upon request by the sponsor, the standard was advanced to the status of American Standard in 1930.

A6-1925—Specifications for Drain Tile

Scope—Specifications for drain tile made of shale, fire clays, or surface clays, and of concrete.

In 1921 the American Society for Testing Materials submitted their specifications for Drain Tile for approval as American Tentative Standard, and in March, 1922, they received the approval of ASA. The A.S.T.M. Committee C6 on Drain Tile was approved as a sectional committee of ASA, a few additional representatives of interested organizations having been made. As a result of the work of this sectional committee, certain revisions of the standard were proposed, and in 1925 the standard was revised and received the status of American Standard. Since that time the sectional committee has held several meetings, research work has been carried on, and in March, 1930, the following revisions of the existing standard were announced as being under consideration: inclusion of a requirement for rate of applying load in making strength tests; revision of the strength test requirements to provide a closer correlation between required test strengths and loads for specified depths of ditch; inclusion of standards and tests covering durability in acid and alkali soils; revision of the requirements for the lower three-edge bearing when testing large tile, and the inclusion of the "Minnesota" bearing (lower sand-bearing and upper three-edge bearing).

A13-1928—Identification of Piping Systems

Scope—Identification of piping systems in industrial and power plants which are not buried in the ground; with especial reference to personal hazards in times of accident at a plant; including conduits for the transport of gases, liquids, semi-liquids, or plastics, but not including conduits filled with solids.

Chairman—A. S. Hebble, Superintending Engineer, Southern Pacific Steamship Lines, New York, N. Y.

Secretary—I. G. Hoagland, Secretary, National Automatic Sprinkler Association, New York, N. Y.

The work on this subject was undertaken by a sectional committee organized in 1922, the American Society of Mechanical Engineers and the National Safety Council being the joint sponsors. Three subcommittees—on identification by colors, on identification by markings other than colors, and on classification (of materials carried in pipes)—cooperated in the development of the present American Recommended Practice. The main classification of materials is as follows: fire protection equipment; dangerous materials; safe materials; protective materials; and extra valuable materials. An Appendix lists a large number of specific materials classified according to the above scheme.

A19-1923—Method of Test for Voids in Fine Aggregate for Concrete

Submitted as an existing standard by the American Society for Testing Materials, this standard was approved as an American Tentative Standard in 1923. It has not been revised since, nor has its status been changed.

A21—Specifications for Cast-Iron Pipe and Special Castings

Scope—Unification of specifications for cast-iron pipe, including: materials; dimensions; pressure rating; methods of manufacture (including such new developments as centrifugal casting), in so far as they may be necessary to secure satisfactory specifications; elimination of unnecessary sizes and varieties; consideration of the possibility of developing a coordinated scheme of metallic pipe and fittings applicable to all common mediums; and methods of making up joints in so far as they are determining as to the dimensional design of cast-iron pipe. The types of cast-iron pipe to include: bell and spigot

pipe; flanged pipe; flanged and bell mouth fittings and wall castings; pipe elbows, tees, Y's, return bends, and other fittings not now included in standard lists; cast-iron pipe threaded for flanges or couplings. The standardization is not to include: methods of installing pipe and similar matters, except as to the making up of joints with relationship to the dimensional standardization of pipe and fittings as noted above.

Chairman—Thomas H. Wiggin, Construction Engineer, Federal Water Service Corporation, New York, N. Y.

Vice-Chairman—N. F. S. Russell, President, U. S. Cast Iron Pipe and Foundry Company, Burlington, N. J.

Secretary—C. C. Simpson, Jr., General Superintendent of Mains, Consolidated Gas Company of New York, New York, N. Y.

A sectional committee to deal with this project under ASA procedure was organized in 1926. There are four joint sponsors: the American Water Works Association, the New England Water Works Association, the American Gas Association, and the American Society for Testing Materials. In its organization meeting the sectional committee voted to omit soil pipe from the scope of its work, at least for the present. This subject has since been taken up by subcommittee 8 of sectional committee A40 on Plumbing Equipment.

The work of sectional committee A21 is divided among three technical committees, as follows: 1—dimensions; 2—metallurgy, processes, and tests; 3—corrosion and protective coatings. These technical committees are divided again into subcommittees, as follows:

Technical Committee 1 into subcommittees: 1-A—barrel of sand cast pipe; 1-B—bell and spigot dimensions of cast-iron pipe, including lugs and harnesses; 1-C—to consider all types of pipe other than sand cast; and 1-D—fittings.

Technical committee 2 into subcommittes: 2-A—raw materials and melting practice; 2-B—metallurgy and chemistry; 2-C—physical tests and test specimens; and 2-D—experience.

Technical committee 3 into subcommittees: 3-A—theory of corrosion of cast-iron pipe; 3-B—organic coatings (coal, tar, asphalt, etc.); 3-C—inorganic coatings (cement linings, etc.); 3-D—water corrosion experience; 3-E—soil corrosion; 3-F—hydraulics.

In addition to these subcommittees, there is a publicity committee, a finance committee, and a conference committee, the latter to maintain liaison with the ASA sectional committees, Pipe Flanges and Fittings (B16), Code for Pressure Piping (B31), and Wrought Iron and Wrought Steel Pipe and Tubing (B36).

A considerable amount of research work has already been done on the strength and hydraulic properties of pipe and fittings. This work is still going on. A report on cement lining for pipe lines used for carrying water has reached an advanced stage and may be ready in the near future for publication for general criticism and comment.

A24—Architectural Terra Cotta and Methods of Setting

Scope—Specifications for architectural terra cotta and its setting, terra cotta being a burned clay product in architectural forms, set as masonry and principally used for the facing and decoration of the exterior masonry work of buildings.

Specifications for the manufacture, furnishing, and setting of terra cotta, developed jointly by the National Terra Cotta Society and the American Institute of Architects, were submitted in 1923 to ASA as a working basis for a sectional committee whose organization was requested by the two bodies. They offered to be joint sponsors. A special committee appointed by ASA to advise on the subject recommended approval of the above scope and sole sponsorship of the Bureau of Standards. The Bureau accepted sponsorship, organized a sectional committee, and submitted the personnel of this committee to ASA for approval, together with a recommendation by the sectional committee that the specifications as submitted by the National Terra Cotta Society and the American Institute of Architects be approved with one minor change. A special committee was appointed by ASA to advise with regard to the approval of both the personnel and the specifications. On the basis of its report, ASA referred the specifications back to the sponsor with the advice that they might be re-submitted after reorganization of the sectional committee to make it more representative of the groups concerned with the project and after due consideration of the specifications by the sectional committee thus reorganized. No action being taken by the sponsor, ASA considered in 1927 the dropping of the project from the list of its projects provided this were satisfactory to the National Terra Cotta Society and the American Institute of Architects. However, both of these organizations requested that the project be kept on the ASA books until such time as it might be actively taken up again.

A25—Specifications for Movable Railway Bridges

Refer to Project A3a.

A26-1930—Method of Sampling

Stone, Slag, Gravel, Sand, and Stone Block, for Use as Highway Materials

Scope—Methods covering the selection of samples of stone from ledges or quarries; field stone; boulders; blast furnace slag; sand and gravel; and miscellaneous materials used as substitutes for sand, gravel, broken stone, and stone block; and methods of shipping and marking samples.

Submitted by the American Society for Testing Materials as an existing standard, this method of test was approved by ASA as an American Tentative Standard in 1924, the A.S.T.M. being appointed sole sponsor. Upon request by the sponsor, the standard was advanced to the status of American Standard in 1930.

A27-1924—Method of Test for Apparent Specific Gravity of Coarse Aggregates

Scope—Methods of determining apparent specific gravity of coarse aggregates such as are used in Portland cement concrete, bituminous concrete and water-bound bituminous macadam road construction, or any other types of construction requiring the use of coarser aggregate.

This standard was approved in 1924 as American Tentative Standard by ASA, having been submitted by the American Society for Testing Materials as an existing standard.

A31-1924—Specifications for Materials for Cement Grout Filler for Brick and Stone Block Pavements

Scope—Specifications covering materials used in the preparation of cement grout when used as a filler for brick or stone block pavements, including sand, water, and, by reference, Portland cement.

This standard was approved in 1924 as American Tentative Standard by ASA, having been submitted by the American Society for Testing Materials as an existing standard.

A34—Specifications for Design and Construction of Steel Highway Bridge Superstructure

Refer to Project A3a.

A35—Manhole Frames and Covers

Scope—Standardization of design, material, and dimensions of manhole frames and covers.

Chairman—L. B. Fish, American Telephone and Telegraph Company, New York, N. Y.

Secretary—C. B. Shaw, New York Edison Company, New York, N. Y.

This project was undertaken as a result of a conference held under the auspices of the Division of Simplified Practice in October, 1924. The conference decided to ask ASA to have the work done under ASA procedure. A special committee appointed by ASA to consider the questions of sponsorship and scope recommended that the ASA Telephone Group and the American Society of Civil Engineers be invited to act as joint sponsors for the work. A sectional committee was organized and divided into six subcommittees, as follows: sewer, water, gas, steam, and air; electric light and power; electric railways and steam railways; communication systems; specifications and inspection; and a correlating committee.

Drawings have been prepared covering the various types and sizes of manhole frames and covers recommended by the several subcommittees, and in January, 1931, the various subcommittee drafts of the proposed standards were submitted to the sectional committee. After review by the sectional committee it is planned to give wide circulation of the revised drafts for general criticism and comment.

A36—Rating of Rivers

Scope—Units and bases for rating rivers for producing water power.

Chairman—N. C. Grover, U. S. Geological Survey, Washington, D. C.

Secretary—W. G. Hoyt, U. S. Geological Survey, Washington, D. C.

The need for a standard method of rating of rivers was realized in the course of the World Power Conference in London in 1924, when statements of the power resources for different countries were made on different bases, and were therefore not comparable. Upon request of the U. S. Geological Survey the matter was taken up by ASA, and following the recommendations of a special committee, a scope was formally approved, the U. S. Geological Survey was designated to take the leadership in the work, and a technical committee of over forty engineers, representing consulting engineering, financial and management groups, manufacturers, state and municipal organizations, and the federal government, was organized. By October, 1926, the sectional committee had, through discussion and correspondence, worked out a comprehensive plan for rating the power of rivers, including recommendations as to the units to be used. The committee considers it of the first importance to secure international uniformity in the matter. A preliminary canvass of foreign national standardizing bodies was made, and it was finally decided that international cooperation should be carried out through the channel of the International Elec-

trotechnical Commission. Numerous interchanges have taken place, and two international conferences have been held, the first in Bellagio, Italy, in 1927, and the second in Stockholm, Sweden, in 1930. The committee now plans to press for early consummation of its work.

A37—Methods of Testing Road and Paving Materials

Up to 1926 nearly all standards on road and paving materials which were approved by ASA had been submitted by the American Society for Testing Materials as existing standards. Revision of such standards required cooperation between the A.S.T.M. and the other organizations representing the largest users of road materials, such as the American Association of State Highway Officials, the American Society for Municipal Improvements, and the U. S. Bureau of Public Roads. Informal conferences between delegates of the four organizations mentioned led to a proposal that a more comprehensive scheme of handling standardization work relating to road materials be developed.

In 1926, ASA called a general conference which decided that standardization of methods of test of road and paving materials should be unified through a sectional committee based on A.S.T.M. Committee D4 on Road and Paving Materials as a nucleus. The A.S.T.M. was appointed sole sponsor and organized the sectional committee in question. It is expected that as many as fifty standards falling under the scope of this project will ultimately be developed by the sectional committee.

This sectional committee so far has had three standards approved by ASA, as follows:

A37a-1930—Standard Method of Test for Penetration of Bituminous Materials

A37b-1930—Standard Method of Float Test for Bituminous Materials

A37c-1930—Standard Method of Test for the Determination of Bitumen

These standards were approved in 1929 as American Tentative Standards, and advanced in 1930 to American Standards.

A38-1927—Sizes of Steel Spiral Rods for Concrete Reinforcement

Scope—Sizes of rods, diameters, and pitches of spirals of stock steel spiral rods for concrete reinforcement.

In 1926 the then existing National Committee on Metals Utilization of the Department of Commerce submitted Simplified Practice Recommendation 53 on Steel Spiral Rods (for Concrete Reinforcement) to ASA as an existing standard for approval as an American Standard. This document had been developed by a general conference of representatives of manufacturers, distributors, and users of the product concerned, held under the procedure of the Division of Simplified Practice of the Bureau of Standards.

A special committee, appointed by ASA to make a recommendation on approval of the standard and on sponsorship, reported favorably on approval and recommended joint sponsorship of the National Committee on Metals Utilization and the Concrete Reinforcing Steel Institute. The standard was approved by ASA in 1927. The National Committee on Metals Utilization having been merged in the meantime with the Bureau of Standards, joint sponsorship was assigned to and accepted by the Bureau and the Concrete Reinforcing Steel Institute.

A40—Standardization of Plumbing Equipment

Scope—Standardization of plumbing equipment including materials, uniformity of roughing-in dimensions, efficiency of operation, and other performance specifications.

Chairman—William C. Groeniger, Consulting Sanitary Engineer, Columbus, Ohio.

The sectional committee on this subject was organized in 1927 upon request of the American Society of Mechanical Engineers. The work is subdivided among eight subcommittees, as follows: 1—a subcommittee to deal with the report entitled "Recommended Minimum Requirements for Plumbing," developed by the Subcommittee on Plumbing of the Building Code Committee, appointed under the auspices of the U. S. Department of Commerce; 2—staple vitreous china plumbing fixtures; 3—staple porcelain (all clay) plumbing fixtures; 4—plumbers' threads; 5—traps; 6—brass plumbing products; 7—copper water tube fittings; 8—cast-iron soil pipe and fittings.

The work of subcommittees 1 to 4, inclusive, is closely coordinated with that of the committees organized under the auspices of the Department of Commerce to deal with the same subjects, the personnels of the corresponding committees being the same. So far, one draft standard on brass fittings for flared copper tubes has been published for criticism and comment. It was developed by subcommittee 7.

A41—Recommended Practice for Brick Masonry

Autonomous Sectional Committee

Early in 1928 the Common Brick Manufacturers' Association requested that a standard

code for brick masonry be developed under ASA auspices. It was stated that with the completion of strength tests on brick masonry at the U. S. Bureau of Standards, most of the data which might be needed would have been accumulated and made available, and would enable those experienced in the construction art to formulate a code of recommended practice for brick masonry. Further, there seemed to be an insistent and increasing demand for such a code.

Following a conference on June 6, 1928, a sectional committee, consisting of 14 representatives of as many national bodies, was organized and held its first meeting in October of the same year. Ten subcommittees were set up for different phases of the work, as follows: brick masonry materials; types of brick masonry: design of brick masonry; essentials of good workmanship; construction of brick masonry; fire resistance requirements; water penetration; durability or weathering; efflorescence and staining; data and information.

Elaborate drafts of the first two sections have been prepared and are now under consideration by the subcommittees.

Inquiries in regard to the project have been received from Sweden, where active work on the subject is going forward.

A42—Specifications for Plastering

Scope—Specifications for interior cement, lime, and gypsum plastering, and for exterior plastering (stucco).

Chairman—A. O. Lynas, Dwight P. Robinson and Company, New York, N. Y.

Vice-Chairman—L. E. Kern, Technical Secretary, Structural Department, American Institute of Architects, Washington, D. C.

Secretary—F. B. Stevens, Jr., Stevens Master Specifications, Inc., Chicago, Ill.

The Finishing Lime Association of Ohio requested ASA in 1928 to have standard specifications for finishing hydrated lime plaster taken up by a sectional committee organized under ASA procedure. When this request was considered by ASA, representatives of the American Society for Testing Materials and the American Institute of Architects expressed the opinion that it might be desirable to expand the scope of the sectional committee, if organized, to cover also other plastering materials and processes. Shortly afterward, the A.S.T.M.s uggested to ASA that a sectional committee be organized to deal with specifications on cement, lime, and gypsum plastering, and that the A.S.T.M. and the A.I.A. be joint sponsors. The intention was to confine the scope of the work to inside plastering work, that is, not to include exterior or stucco work. These suggestions appeared to be agreeable to all groups having a major interest in the subject and were approved by ASA. The A.S.T.M. and the A.I.A. became joint sponsors and a sectional committee was organized. At its first meeting the committee decided also to include plastering (cement, lime, and gypsum) for exterior work (stucco) in the scope, and appointed subcommittees to deal with: lime plastering; gypsum plastering; cement plastering; metal lath; and a coordinating committee.

A43-1930—Putty

In October, 1928, the Federal Specifications Board submitted to ASA the U. S. Government Master Specifications (F.S.B. No. 283) for Putty, for approval as American Standard, under the existing standards method. A special committee was appointed to make recommendations in regard to the approval of these specifications, and a long correspondence ensued. Finally, upon recommendation of this special committee, the standard was approved by ASA as an American Tentative Standard in January, 1930; and the Bureau of Standards was invited to act as sponsor for future revisions. The special committee felt that the standard was not the best that could be drawn up, and that a sectional committee should be set up, and revision of the specifications started. Under date of January 5, 1931, ASA received a proposed revision of the federal specifications for putty, but this has not as yet been formally submitted for action.

A44-1931—Standard Method of Test for Organic Impurities in Sands for Concrete

A45-1931—Standard Method of Test for Sieve Analysis of Aggregates for Concrete

The two above standards were submitted as existing standards by the American Society for Testing Materials and approved by ASA as American Tentative Standards in 1922, the A.S.T.M. being appointed sole sponsor. In 1930, the A.S.T.M. submitted revisions of both standards which were approved by ASA as American Tentative Standards under the proprietary standards method.

Track Bolts Standard Published

The American Standard, Track Bolts and Nuts (B18d-1930), the approval of which was announced in the January issue of the ASA BULLETIN, is now published, and copies may be obtained for loan or purchase at 40 cents per copy through the ASA Information Service.

Symbols for Heat and Thermodynamics Approved

A new American Tentative Standard, Symbols for Heat and Thermodynamics (Z10c-1931), has been approved by the ASA Standards Council.

The standard is the result of extensive work by the subcommittee for heat and thermodynamics of the Sectional Committee on Scientific and Engineering Symbols and Abbreviations which cooperated with the International Electrotechnical Commission and with the National Research Council. A tentative list of the symbols was submitted to a subcommittee of the Advisory Committee on Steam Turbines of the International Electrotechnical Commission for discussion at a meeting in 1928. A large proportion of the symbols in the list were tentatively adopted at that time by the Advisory Committee.

The symbols for heat transmission included in the present standard were adopted jointly by the subcommittee on symbols for heat and thermodynamics and by the Committee on Heat Transmission of the National Research Council following extensive correspondence between the two bodies.

The new standard will be of interest to power plant designers, turbine engine designers, boiler designers, and all others working with the problems involved in the transfer and transmission of heat.

The standard is one of several projects already developed or being developed by the Sectional Committee on Scientific and Engineering Symbols and Abbreviations. The following approved standards have thus far resulted from the work of this committee:

Symbols for Hydraulics (Z10b-1929)

Symbols for Photometry and Illumination Z10d-1930)

Aeronautical Symbols (Z10e-1929)

Mathematical Symbols (Z10f-1928)

Letter Symbols for Electrical Quantities (Z10g1-1929)

Symbols for Telephone and Telegraph Use (Z10g6-1929)

Navigational and Topographical Symbols (Z10h-1930)

The sponsors for the Sectional Committee on Scientific and Engineering Symbols and Abbreviations are:

American Association for the Advancement of Science

American Institute of Electrical Engineers

American Society of Civil Engineers

Society for the Promotion of Engineering Education

The American Society of Mechanical Engineers

The standard is now available at 30 cents per copy through the ASA office.

Officers of ASA Mining Committee Elected

Officers of the Mining Standardization Correlating Committee for the year 1931 were elected at the February 18 meeting of the Committee as follows:

E. A. Holbrook, University of Pittsburgh, Pittsburgh, Pa., *chairman*

Warren R. Roberts, Roberts & Schaefer Company, Chicago, Ill., *vice-chairman*

Lucien Eaton, 17 Battery Place, New York City, *vice-chairman*

The other members of the Executive Committee of the Mining Standardization Correlating Committee are as follows:

J. D. Conover, American Zinc Institute, New York City

Rush N. Hosler, Harrisburg, Pa.

L. E. Young, Pittsburgh Coal Company, Pittsburgh, Pa.

At the same meeting it was announced that the following changes in the personnel of the Committee have taken place during the past year:

L. E. Young, Pittsburgh Coal Company, Pittsburgh, represents the American Institute of Mining and Metallurgical Engineers in place of Howard N. Eavenson, Union Trust Building, Pittsburgh. Mr. Eavenson is alternate for Mr. Young, representing the Institute.

W. Val DeCamp, United Verde Copper Company, Jerome, Arizona, represents the American Mining Congress in place of H. DeWitt Smith, Newmont Mining Corporation, New York City.

Rush N. Hosler, Harrisburg, Pennsylvania, is alternate, representing the National Safety Council in place of B. F. Tillson, Construction Engineer, North Caldwell, New Jersey.

Walter S. Paine, Engineering and Inspection Department, Aetna Life Insurance Com-

pany, Hartford, Connecticut, represents the National Bureau of Casualty and Surety Underwriters in place of L. A. DeBlois, Consulting Engineer, New York City.

C. B. Huntress, National Coal Association, Washington, D. C., is alternate, representing the National Coal Association in place of H. L. Gandy, Pattison and Bowns, New York City.

The resignation of the American Zinc Institute, tendered because of the fact that the interest of the Institute in the work of the Committee was too small to warrant active participation and membership, was accepted by the Committee.

Sectional Committee for Grandstand Project Organized

The sectional committee which will have charge of the development of the Safety Code for Grandstands (Z20) has been organized, and the personnel has been approved by the American Standards Association.

In developing the code the committee will consider the design and construction, stability, and strength of permanent and temporary outdoor stands and of temporary and portable indoor stands for the seating of audiences; the volume and facility of exits from the standpoint of flow of traffic and prevention of panic jams; fire hazards, and the provision of fire fighting equipment for wooden or other combustible stands; sanitary arrangements; and the methods of erection of temporary and portable stands.

The organizations represented on the committee are: American Institute of Architects, American Institute of Steel Construction, American Society of Civil Engineers, American Society for Municipal Improvements, Association of Governmental Officials in Industry of the United States and Canada, Belmont Iron Works, Circle A Products Corporation, City Managers' Association, Dixie Portable Bleacher Company, International Association of Fairs and Expositions, National Association of Amusement Parks, National Association of Mutual Casualty Companies, National Bureau of Casualty and Surety Underwriters, National Collegiate Athletic Association, National Fire Protection Association, National Lumber Manufacturers Association, New Jersey Department of Labor, Ohio Department of Labor, Pennsylvania Department of Labor and Industry, Portland Cement Association, Ringling Brothers, Barnum and Bailey, U. S. Department of Labor, U. S. Polo Association, Virginia Bridge and Iron Company, Wayne Iron Works.

Standard for Wrought-Iron Plates and Bars Approved

The American Standards Association has approved two new American Tentative Standards, Specifications for Refined Wrought-Iron Bars (G12-1931), and Specifications for Wrought-Iron Plates (G13-1931). These are proprietary standards submitted by the American Society for Testing Materials as sponsor.

Both specifications were originally approved by ASA in 1923 as American Tentative Standards under the existing standard method of procedure. They have now been revised by the addition of a definition for wrought iron and the elimination of the reference to puddling. The definition of wrought iron reads:

> "Wrought iron is a ferrous material, aggregated from a solidifying mass of pasty particles of highly refined metallic iron with which, without subsequent fusion, is incorporated a minutely and uniformly distributed quantity of slag."

The elimination of the reference to puddling affects the specifications concerning the manufacture of the products. The original specifications stipulated that the bars according to G12 and the piles according to G13 should be made from puddled iron. The revised specifications simply specify that the bars and piles shall be made from wrought iron.

Copies of the standards are available at 25 cents per copy through the ASA Information Service.

Proposed Standard for Cylinders and Adapters Available

A tentative draft of a proposed standard for Rotating Air Cylinders and Adapters (B5g1), developed by technical committee 11 on chucks and chuck jaws of the Sectional Committee on Small Tools and Machine Tool Elements (B5) has been published for general criticism and comment.

The purpose of the standard is to obtain interchangeability of different makes of air cylinders on the spindles of machine tools without changing the adapter or draw rod.

Sponsors for the project are the Society of Automotive Engineers, the National Machine Tool Builders' Association, and the American Society of Mechanical Engineers.

A limited number of copies of the draft may be borrowed for review from the ASA Information Service.

Benefits from Standardization of Printed Forms[1]

by

Alan D. Duff
Stone and Webster Service Corporation

A standardization program which has resulted in savings by a single organization of over one million dollars in four years

In the past few years there has been a definite tendency toward economical office efficiency. Executives have come to realize that an important aid in management of modern business and industry lies in the gathering promptly of accurate figures and facts. Since the office personnel is efficient in direct proportion to the tools employed, it stands to reason that a comprehensive routine with carefully standardized forms is not merely economy but a valuable cumulative asset.

This article is intended to convey to the reader an idea with a workable plan, the essence of which, like character, must be caught, not taught.

It is my purpose to deal with the general aspects and give a brief outline of the benefits to be derived from a "Standardization Department," whose chief function is to establish standard printed forms for record keeping that may be adopted for economical and practical reasons by all offices or companies. It would perhaps be well to define the term "Standard Form." A "Standard Form" is one that is designed to serve a maximum number of companies and purposes. It is a piece of printed matter on a standard grade of paper of one color, using one color of ink, and can be cut without waste from standard sizes of paper as manufactured. The work of such a department falls into three divisions, those of design, purchase, and stores.

Study of Related Forms Necessary

The first of these divisions, that of design, plans the standardization of the forms. To do this, it must make a thorough study of related forms used in the various sub-offices, and other forms of general scope. In this phase of the work, method must be seriously considered. In fact, the study of method is the chief activity of the division of design, for it is through the knowledge so obtained that the number of forms are materially reduced. For example, a group of small companies had been using 997 forms consisting of payroll records, store records, journal entries, vouchers, meter reading slips, and memorandums, whereas the final forms standardized to account for such transactions were some eleven in number. To take a single item—voucher checks, of which there were in use before standardization 200 designs, consisting of 41 sizes, 9 colors, 18 grades of paper—were reduced to one design, one size, one color, and one grade of paper. What could be simpler than the design of an office memorandum, and yet there were in use 73 different designs with a variety of size, color, and paper. These forms were reduced through standardization to one each of design, color, and paper.

Figures 1, 2, and 3 show what is being accomplished by this work.

From studying methods, it is also possible to design a form to serve several purposes, as in the case of a sales system whereby the order, invoice, ledger, stock slip, and journal entries are made at one time with a single operation. Care is taken to allow for ample room for the recording of necessary information, at the same time leaving as little waste space as possible. For this reason, any unnecessary margins or headings are omitted. There are several type faces of printing that may be used, each one serving a special purpose.

After a form has been designed and accepted, the type is set and an electroplate is made. This plate is used by the printer and saves the cost of set-up each time a quantity of forms is desired. On forms where ruling is necessary, the first plate made is used as a master plate and electroplate copies are made from this. The original plate, called the "master plate," is carefully saved.

[1] Reprinted from the February, 1931, issue of the *N.E.L.A. Bulletin.*

Another phase of the work of the Division of Design is to keep in touch with the printing art in order to eliminate unnecessary printing operations. To save setting up of type and cleaning of presses, only one color of ink is used since as many set-ups of type are required as there are colors of ink. In the case of perforations, a separate operation is eliminated by the use of perforating rules used on printing presses. In designing forms requiring numbering, space is left for a numbering machine to fit in the plate, and numbering is done at the same time the form

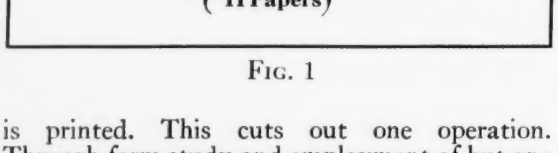


FIG. 1

is printed. This cuts out one operation. Through form study and employment of but one color of paper, the process of collating or assembling is also eliminated.

Group Printing Cuts Cost

The second division, that of purchase, by making use of group printing greatly reduces one of the major items of office expense, the cost of forms for record keeping. The most expensive way to buy printing is to order in small quantities and only such forms as are in immediate demand, for small quantities mean short runs on presses and to make a profit on a short run the printer must charge a rate sufficiently high to cover unproductive press space. By ordering on a production basis all forms required during a period of a year, this division can secure the benefits of combination runs. A combination run means that with each revolution of the press, six, ten, or more different forms can be printed as cheaply as one, in so far as press cost is a factor in the final cost of the order. It also means that the printer is able to avoid waste in cutting and to utilize the full mill size paper, for with all the different forms before him at one time, it is possible to make an intelligent layout and correct running combinations. While each form may be of a different size, the total dimensions of the forms collectively must cover a large sheet in a manner that will cut down wastage to a minimum. On the layout, forms are so arranged that they can be padded in large sheets and cut afterward, which provides another saving.

The division of purchase also determines whether the printer should be supplied the paper, or the printer furnish it, according to the best possible saving. Paper is sometimes purchased in large quantities for additional savings. This division keeps in close touch not only with printers, including specialty printers for tags, sales forms, etc., but also with distributors of office supplies and equipment. Proofs are examined by this division, the electroplates ordered and loaned to the printer. All invoices are, of course, passed through the purchase division for approval and shipping instructions, etc.

Requirements for reprints of forms used at the various localities are accumulated and bids obtained for the total number. Upon request, bids are also obtained for forms peculiar to one company for comparison with bids by printers in the city or town in which the company operates. In awarding the bids, consideration is, of course, given to the cost of transportation. A specification is furnished the printer for manufacture of each form. If office supplies are ordered in small quantities, it is as well to purchase them locally because of transportation costs. If, on the other hand, the various requirements are accumulated, as in the case of standard forms and orders placed even quarter-annually, appreciable savings may be realized.

The division of stores stocks a supply of forms that have no company name printed thereon as well as the standard forms. In many cases, purchases are not shipped direct from the printer to the local companies, but are delivered to this division, where they are divided and repacked with other forms ordered by the various companies or offices, thus effecting a saving on transportation costs.

The manner in which the local office or company stores its stationery, and office supplies, may create further savings. Whenever possible, they should be kept in a special storeroom

CONSUMERS BILLS

Excluding Puget Sound Companies

Before Standardization	*After Standardization*
143 Designs	36 Designs
78 Sizes	2 Sizes
89 Kinds of Paper	2 Kinds of Paper
9 Colors	2 Colors
$22,531.00 Annual Cost	$9,068.00 Annual Cost

Annual Savings of $13,463.00 or 60%

FIG. 2

with ample space allowed for an annual supply of each form. By storing the forms in numerical order with a bin tag showing the minimum supply necessary for, say, a two-month period, an eye check will show whether or not the quantity is close to the minimum figure. The forms,

which are usually in packages, can be easily counted.

The foregoing system contemplates the use of the regular printing establishments on a competitive bid basis consistent with satisfactory work.

Such a department requires the services of from two to fifteen individuals, depending upon the size of the company or group of companies, and the variety of statistics.

Summing up, it may be seen that in a number of ways surprisingly large savings are obtained through the standardization of printing and stationery no matter what the size of the company. The greatest, perhaps, is effected by keeping the number of forms at a minimum consistent with the requirements of the maximum number of offices or companies. The use of standard sizes of paper further increases savings in cost as it permits of purchases in large quantities, allows of group printing, and eliminates paper waste. Through the use of group printing, costs are reduced to a minimum, for by this means it is possible to utilize the press capacity, thus saving press space and time. Additional savings accrue from the custom of ordering well in advance quarterly reprints of the forms used in the greatest quantities, for this permits the printer to figure such business as off-peak load and he is able to reduce his price accordingly. Familiarity with the products of specialty printers has also helped to obtain savings. Printing costs are also reduced by the use of but one color of ink, and by the elimination of separate processes for numbering, perforating, etc. The study of method will do away with a large number of forms and printer's operations, as well as duplication of information.

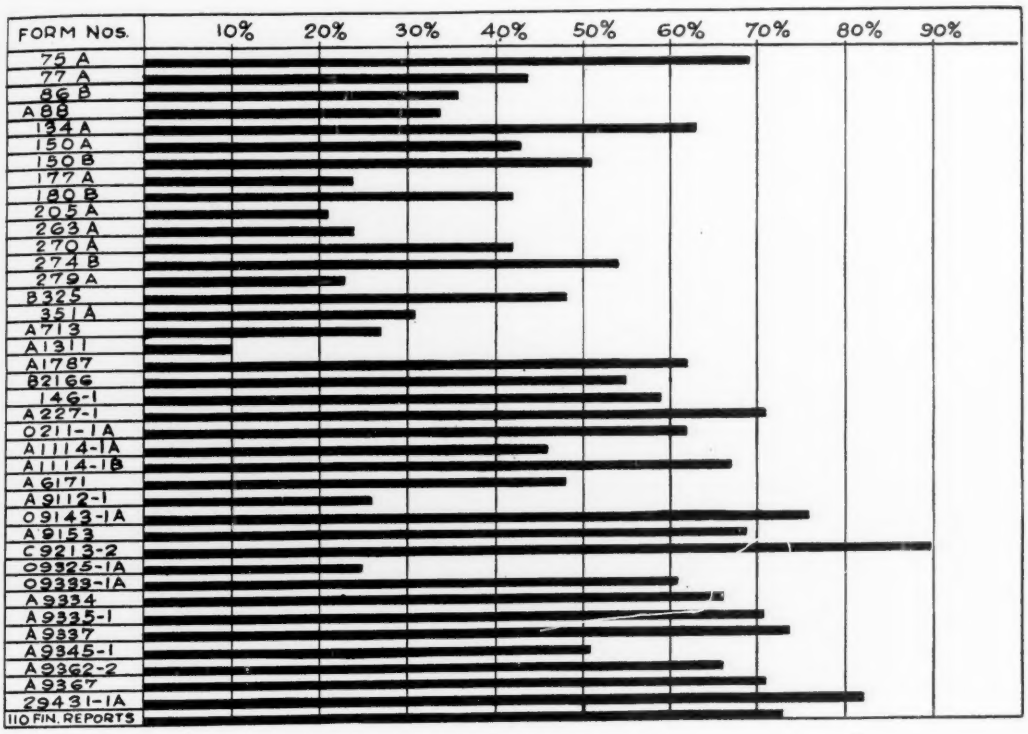


FIG. 3

Percentage of Savings on 40 Representative Forms of Largest Consumption—Based on Cost per Thousand

Very substantial savings are secured in the various localities through advice furnished by the department in connection with forms peculiar to the locality.

There is another type of saving which cannot be estimated. This is the substantial value that the standardization of forms has in reducing clerical labor on unnecessary and unwieldly forms, and the transfer and promotion in personnel, for the employee going to a new office is, under such a plan, familiar with its forms and their uses and has no difficulty in immediately becoming ninety-nine per cent useful in his job.

The argument may be advanced that a printing and stationery policy like the one described will create unfortunate relations with printers. This has not, however, been the experience.

Usually, there are three or four reliable printers in a community, one of whom in many cases is given the bulk of the business. Such printers have, of course, sometimes inquired about the decrease in orders, but when the advantages gained by the company through centralized printing have been explained in detail, the printers have appreciated the fact that they could not compete for standard form business. On certain forms, opportunity is given to them to bid, and in this class of work on which they are on a more or less equal footing, they are fairly successful, but they themselves realize they cannot offer the company benefits equal to those of group printing.

Everybody is out to save money in these days, including the office manager, and it is a real problem for him because he is required to have facts and figures immediately available for the use of his executives. As a result, it is difficult to reduce his force and he must think of other means.

Here, then, is what has proven to be a quick and effective way of reducing operating costs of the entire company with a small outlay. Standardization of forms means standardization of methods and this spells elimination of duplication and lost motion. Not only are savings realized in the first year, but they become cumulative with the advance of time. Within the limits of my experience in the great field of utility work, I have yet to discover a more prolific source of cash savings than lies in the standardization of the printed form. The organization with which I am privileged to be connected has effected a saving under such a program of $1,270,000 in four years. Amazing—indeed it is, and should be incentive enough for every person whose company is not now engaged in this work to undertake it at once.

It means a lot of work and planning to get this thing going smoothly, but the "nubbins" of it all is in the dividends it pays.

Secretaries of Standardizing Bodies Meet in May

A conference of secretaries of national standardizing bodies affiliated with the International Standards Association (ISA) will be held in Copenhagen, Denmark, in May, 1931. There will also be a series of conferences on subjects for which technical committees have been organized under ISA procedure, as follows:

Date	*Project*	*Secretariat*
May 4–5	ISA 20, Aeronautics	Germany
	ISA 10, Drawings	Switzerland
6	ISA 4, Ball bearings	Sweden
	ISA 23, Agricultural machinery	Germany
7	ISA 7, Rivets	Holland
8	ISA 2a, Metric screw threads	Switzerland
	ISA 2b, Metric bolts and nuts	Switzerland
11	ISA 3, Fits between cylindrical parts	Germany
13, 15, and 16	ISA 17, Steel and iron	Switzerland

Sustaining-Members and Member-Bodies of ASA, and sectional committees, are invited to submit to ASA any communications or proposals regarding international cooperation in standardization work, and any comments on ISA proposals which they wish to have transmitted to ISA.

Should representatives of any ASA Member-Body, Sustaining-Member, cooperating body, or sectional committee wish to attend the technical meetings in Copenhagen, ASA will make arrangements for providing such representatives with the proper credentials.

Navy Tests Ball Bearings

Extensive tests of ball bearings which will lead to the establishment of standards and standard methods of test for ball bearings purchased by the United States Navy are being conducted at the Mechanical Laboratory of the Navy Department's Bureau of Engineering. According to the *Bulletin of Engineering Information* of February 1st, issued by the Navy Department, the leading manufacturers of ball bearings are showing great interest in the tests, which will result in the Navy's receiving a more uniform product at a considerable saving to the Government.

Navy Revises Publication on Storage Batteries

The Bureau of Engineering of the Navy Department has issued a revised edition of "Chapter 28, Storage Batteries," of its *Manual of Engineering Instructions*. The document contains detailed information regarding the charging, discharging, and care of the large lead-acid type batteries used on submarines and for smaller portable batteries of both the lead-acid and Edison types.

A copy of the document is available for loan through the ASA Information Service.